DEC 21 1938

ARCHITECTURAL RECORD

COMBINED WITH

AMERICAN ARCHITECT AND ARCHITECTURE

DECEMBER 1938

BUILDING NEWS DESIGN TRENDS BUILDING TYPES

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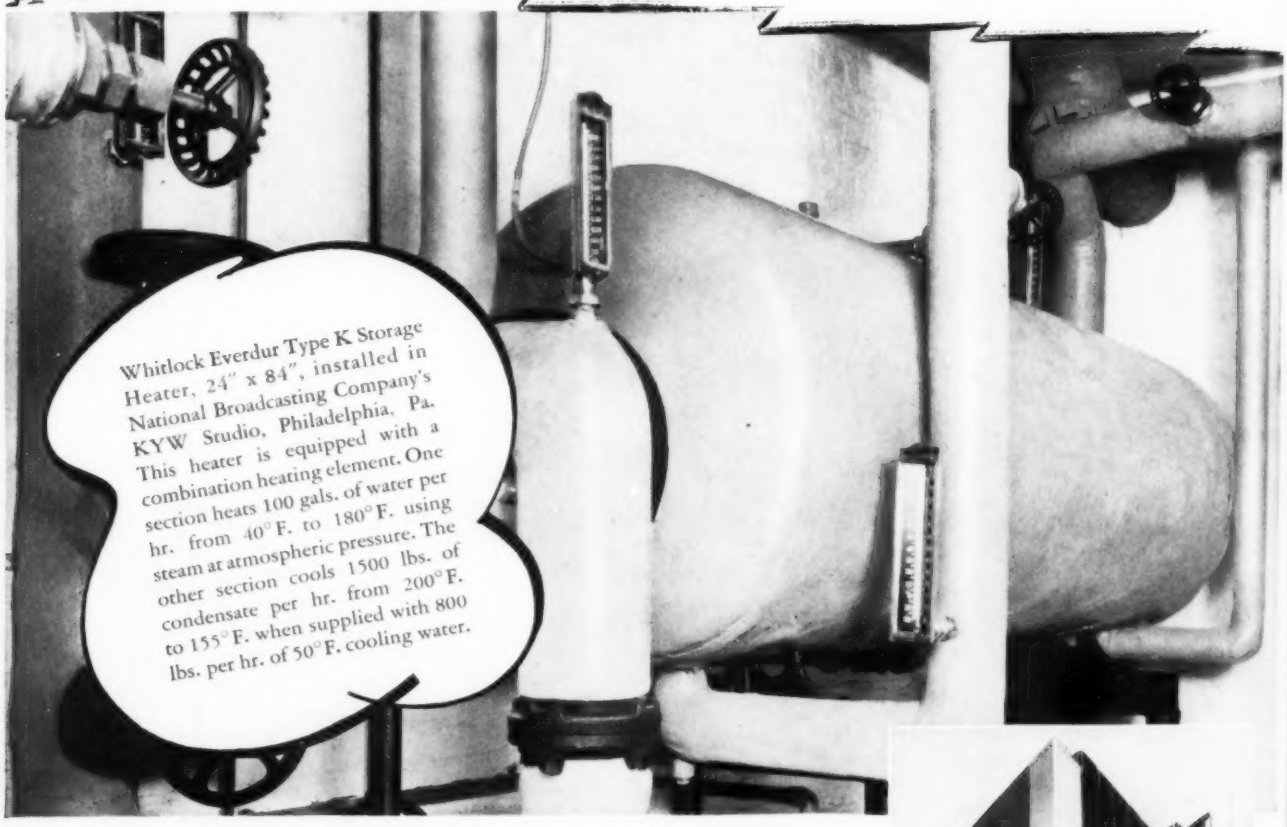
Station KYW—equipped with rustless Everdur—to assure longer service



Whitlock Everdur Type K Storage Heater, 24" x 84", installed in National Broadcasting Company's KYW Studio, Philadelphia, Pa. This heater is equipped with a combination heating element. One section heats 100 gals. of water per hr. from 40° F. to 180° F. using steam at atmospheric pressure. The other section cools 1500 lbs. of condensate per hr. from 200° F. to 155° F. when supplied with 800 lbs. per hr. of 50° F. cooling water.

THE TREND toward modern, more efficient water heating practice is increasing rapidly. This is one reason why heater shells of non-rust Everdur are in such great demand by building and plant owners throughout the country. They have realized that, with Everdur, they get long term economy. Everdur heater shells will be giving excellent service long after those made of rustable metals have been discarded.

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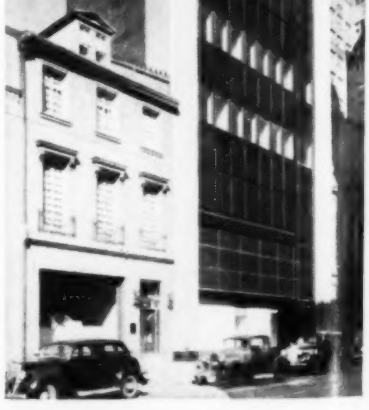
Everdur—The American Brass Company's copper-silicon-alloy—is rustless as copper, yet exceptionally strong. It is easily welded and reasonable in price. This rare combination of qualities means rust-free hot water indefinitely, and reduced expense for upkeep. Everdur tanks and heaters are available for every purpose from leading equipment manufacturers.



Everdur TANK METAL ANACONDA from mine to consumer

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONN.

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ARCHITECTURAL RECORD

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BEHIND THE RECORD

It is your right as a reader to know what to expect from the Record next year as well as next month. So, instead of the customary preview of one issue, let's examine the editorial policies which will hold for 1939.

The first point to keep in mind is that the Record is a single-purpose magazine. It stands for one thing: *better buildings*. It strives to help you produce better buildings by delivering, month in and month out, information which is *useful*—useful as news data, useful as reference data. To make this useful information also easy to use, two sections—*Building News* and *Design Trends*—are devoted to news data, to events and trends respectively; and the other section—*Building Types*—is devoted to reference data, to standards on specific types of buildings. Thus you receive in one time-saving package an organized, pre-digested summary of significant events, trends, and standards.

The *Building News* section is all set now to consolidate the gains made in 1938. Its precise function is to bring to you reports on current events in all fields of activity which indicate deficiencies or potentialities in the design of all types of buildings.

Design Trends has a similar job, but it concerns *trends* instead of events. Frankly, it has been the most unwieldy section to date, but taking form for 1939 are several features which should be worth waiting for. In addition to several more or less technical studies,

(*Continued on page 7*)

Editorial Director: Thomas S. Holden. *Editors:* Orville C. Anderson (*Managing*), James M. Fitch, Jr., Roger Wade Sherman. *Associate Editors:* Elisabeth Kendall, Irvin Kuper, Frank G. Lopez, Jr. *Art Director:* Gene Hawley. *Desk Editor:* William S. Pattison

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Research Consultants: K. Lönberg-Holm and C. Theodore Larson.

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Manuscripts, photographs, and drawings which conform to RECORD'S editorial aims are welcomed. Every effort will be made to return material (if accompanied by stamped, addressed envelopes); but the editors will not be responsible for losses.

Other Dodge Services: REAL ESTATE RECORD, SWEET'S CATALOG FILES, HOME OWNERS' CATALOGS, DODGE REPORTS, and DODGE STATISTICAL RESEARCH SERVICE

For LIGHTNESS of TONE and Fluent Beauty

TWO entirely different problems confront the architect in designing a stairway and an escalator. • Yet the beauty of the latter need not suffer by comparison if a happy choice is made in selecting the decorative metals. • This is apparent from the two photographs here which show both stairway railing and escalator paneling made of Solid Nickel Silver. • The use of this exquisite bronze, bordering on white, for top and side panels of the escalator gives it a fluent beauty of exceptional softness and warmth. • And not only has Solid Nickel Silver the lightness of tone so generally required for the embellishment of modern design, but its soft, lustrous sheen reflects subdued highlights that harmonize perfectly with all the commonly used building materials — wood, stone, marble, tile, plaster, etc. Moreover, Solid Nickel Silver is extremely durable, possesses adequate structural strength, meets all fabricating requirements and is readily available through the usual sources of supply.

Solid NICKEL Silver

• Stair railing of cast and extruded Solid Nickel Silver in Starrett's Netherland Plaza Hotel, Cincinnati, Ohio.

• • •

• Escalators by Otis in the Indianapolis store of William H. Block Co. Side and top panels of lustrous, durable Solid Nickel Silver.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N.Y.

BEHIND THE RECORD

(*Continued from page* 5)

such as the one on welding in this issue or another on glass scheduled for a forthcoming number, there are manuscripts under way on sculpture, landscaping, recreation, city planning and other related subjects.

And as for the *Building Types* section next year, we're going to do something now we've never done before. We're going to give you a complete list of the types of buildings to be covered during an entire year:

Restaurants	January
Schools (Elementary)	February
Housing Developments	March
Retail Stores	April
Houses	May
Factories	June
Houses	July
Schools (High)	August
Apartment Houses	September
Theaters	October
Houses	November
Hospitals	December

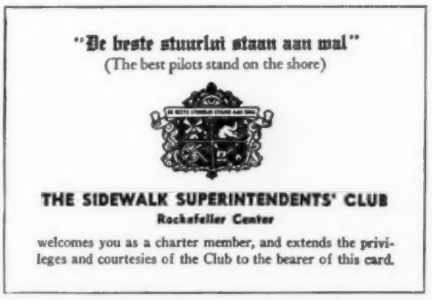
Of course unusual circumstances might force a change or two in this list, but that is how it stands now—twelve 32–40 page reference studies, including Time-Saver Standards data, on types of buildings statistically important.

Excavation kibitzers

KNOTHOLE peekers, steam shovel kibitzers, sidewalk superintendents or what you will, are at last coming into their own in the building industry. Last May the RECORD did a story on the observation gallery provided for spectators of construction-in-progress at NBC's new studio in Hollywood. Later someone told us about a similar development in Des Moines, Iowa.

And now, in New York, Rockefeller Center, Inc., has given the movement new meaning by organizing the Sidewalk Superintendents' Club, with membership cards, coat-of-arms, suggestion-and-complaint box, and some immunities from traffic-minded policemen. A covered gallery protects all members in good standing from both elements and sidewalk traffic at the excavation site of the new Holland building in Rockefeller Center.

Membership cards are cheerfully given to those expressing an undying curiosity and interest in construction activities. Among those to receive membership cards were the judges recently in New York making decisions for the Second Annual Pittsburgh Glass Institute Competition. They are pictured here exercising their new sovereign right as kibitzers.


"De beste stuurlui staan aan wal"
(The best pilots stand on the shore)
THE SIDEWALK SUPERINTENDENTS' CLUB
Rockefeller Center
welcomes you as a charter member, and extends the privileges and courtesies of the Club to the bearer of this card.

Newspictures, Inc.

Photo shows from left to right: William A. Kimbel, Gardner A. Dailey, Albert Kahn, Raymond Loewy, William Lescaze, Paul MacAlister, and the honorary president of the club, George J. Atwell.

Announcements

THE SCHOOL of Architecture of Princeton University announces the *Lowell M. Palmer Fellowship* in Architecture. The Palmer Fellow is exempt from tuition fees and will receive a stipend of $700. All applicants must be American citizens, less than 27 years of age on October 1, 1939, and in good physical condition. To receive consideration for appointment for 1939-40, applications, together with supporting documents, must be received not later than March 1, 1939. Application blanks may be obtained by addressing the Secretary of the School of Architecture, Princeton University, Princeton, N. J.

THE AMERICAN Institute of Architects will award *Edward Langley Scholarships* in 1939 for advanced study, research, and travel. The grants, which will be limited to ten, with no stipend exceeding $1,500, are open to architects, architectural draftsmen, graduate students, and teachers of architecture in the United States and Canada.

Architects may propose any other architects or architectural draftsmen as candidates for the awards to the Re-

(*Continued on page* 8)

"That's the trouble with an inexperienced contractor—he tried to work from an isometric plan!"

—Drawn for the RECORD by Alan Dunn

BEHIND THE RECORD

(*Continued from page 7*)

gional Director of the Institute who represents the district in which the composers and candidates reside. No candidate may propose himself.

All proposals are to be made in duplicate on printed forms obtainable from the American Institute of Architects, 1741 New York Avenue, Washington, D. C. Undergraduates are not eligible for the scholarships, but architectural draftsmen who plan to do undergraduate work or take special courses in architectural schools may be proposed. A second award to the holder of a scholarship is allowed.

THE AMERICAN Academy in Rome has announced its annual competitions for fellowships in architecture, landscape architecture, painting, and sculpture.

The competitions are open to unmarried men not over 30 years of age who are citizens of the United States. The estimated value of each fellowship is about $2,000 a year. The term of a fellowship is two years.

Entries for competitions will be received until February 1st by Roscoe Guernsey, Executive Secretary, American Academy in Rome, 101 Park Avenue, New York City. The applicant should specify the subject in which he desires to compete.

THE GOVERNING Committee of the *James Harrison Steedman Memorial Fellowship* in Architecture announces the opening of the thirteenth annual competition.

The Fellowship offers an award of $1,500 for a year abroad. It is open to all graduates of recognized architectural schools between the ages of 21 and 31, who have had at least one year's practical work in the office of a St. Louis architect.

Application forms may be obtained from the Secretary of the School of Architecture, Washington University, St. Louis, Mo., to whom application blanks properly filled out must be returned not later than January 30, 1939.

The preliminary exercise—a 15-hour sketch—will be held on Saturday, February 11, in the School of Architecture building, Washington University; for candidates residing outside of St. Louis the exercise will be given during the same hours under duly approved conditions.

Corrections

ON PAGE 125 of the September issue, a "C" that should have been a "T" brought forth a protest from La Crosse, Wis. Under the equipment and material schedule for the Country Club Apartments, Greensboro, N. C., the convector-type recessed radiators were credited to Crane Company instead of The Trane Company.

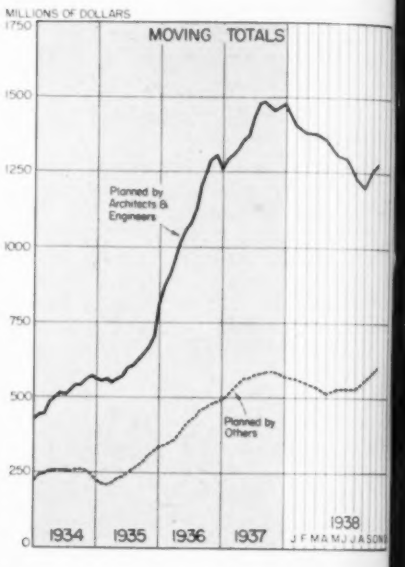
Another manufacturer, Edison General Electric Manufacturing Company, informs us that, from the copy on page 95 of the same issue, some readers might infer table top gas ranges were installed in the Carl Mackley Apartments, Philadelphia, illustrated on page 94. Though we believe this would take some long-range inferring, we like to keep the record straight. The project is equipped with Hotpoint electric ranges.

One slip-up marred our preview last month of the 1939 New York World's Fair. Somehow, somewhere, the printer left an "h" out of Thomas, in the credit line for photographs to Jean Saint-Thomas.

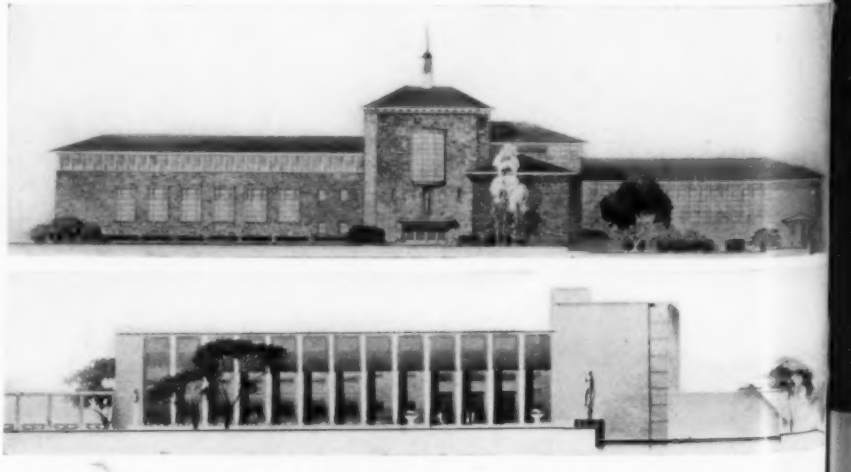
CALENDAR OF EVENTS

- **December 5-10** — Thirteenth National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York, N. Y.
- **December 9-11** — Fourth National Convention International Federation of Architects, Engineers, Chemists, and Technicians. Hotel Raleigh, Washington, D. C.
- **December 11**—"Architectural Backgrounds", lecture by Francis H. Lenygon, President American Institute of Decorators. Three o'clock, Metropolitan Museum of Art, New York, N. Y.
- **December 12-14** — Convention of National Warm-Air Heating and Air Conditioning Association. Hotel Netherland-Plaza, Cincinnati, Ohio.
- **January 1-March 1**—Reception of proposals of candidates for Edward Langley Scholarships. American Institute of Architects, 1741 New York Avenue, Washington, D. C.
- **January 23-26**—Forty-fifth annual meeting, American Society of Heating and Ventilating Engineers. William Penn Hotel, Pittsburgh, Pa.
- **March 1**—Closing date, Lowell M. Palmer Fellowship in Architecture. Applications obtainable from School of Architecture, Princeton University, Princeton, N. J.

WHO BUILDS AMERICA?

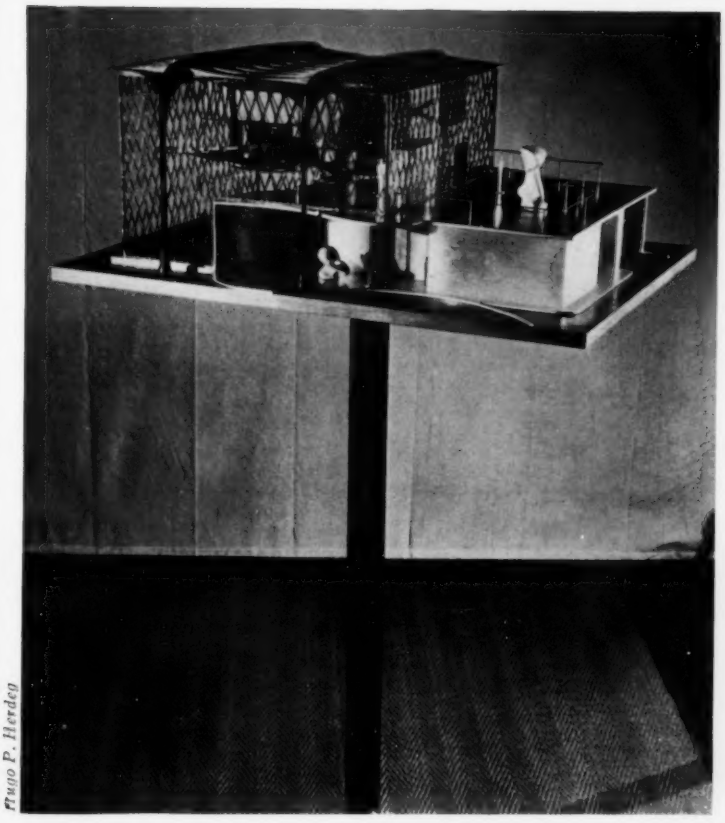


Buildings planned by architects and engineers account for 71% of the total value of all building contracts awarded in the 37 Eastern states, according to F. W. Dodge Corporation reports. The curves on the above chart represent the moving annual totals of building contract awards. Each figure plotted for a given month represents the total for the twelve-month period ending with that month. This type of curve registers the trend and eliminates the seasonal factor.



First prize (upper sketch) in the Goucher College Architectural Competition was won by John C. B. Moore and Robert S. Hutchins, New York, N. Y. Second prize (lower sketch) winners were Eliel and Eero Saarinen, Bloomfield Hills, Mich.

BUILDING NEWS



Hugo P. Herdeg

A HOUSE FOR TOMORROW? . . .

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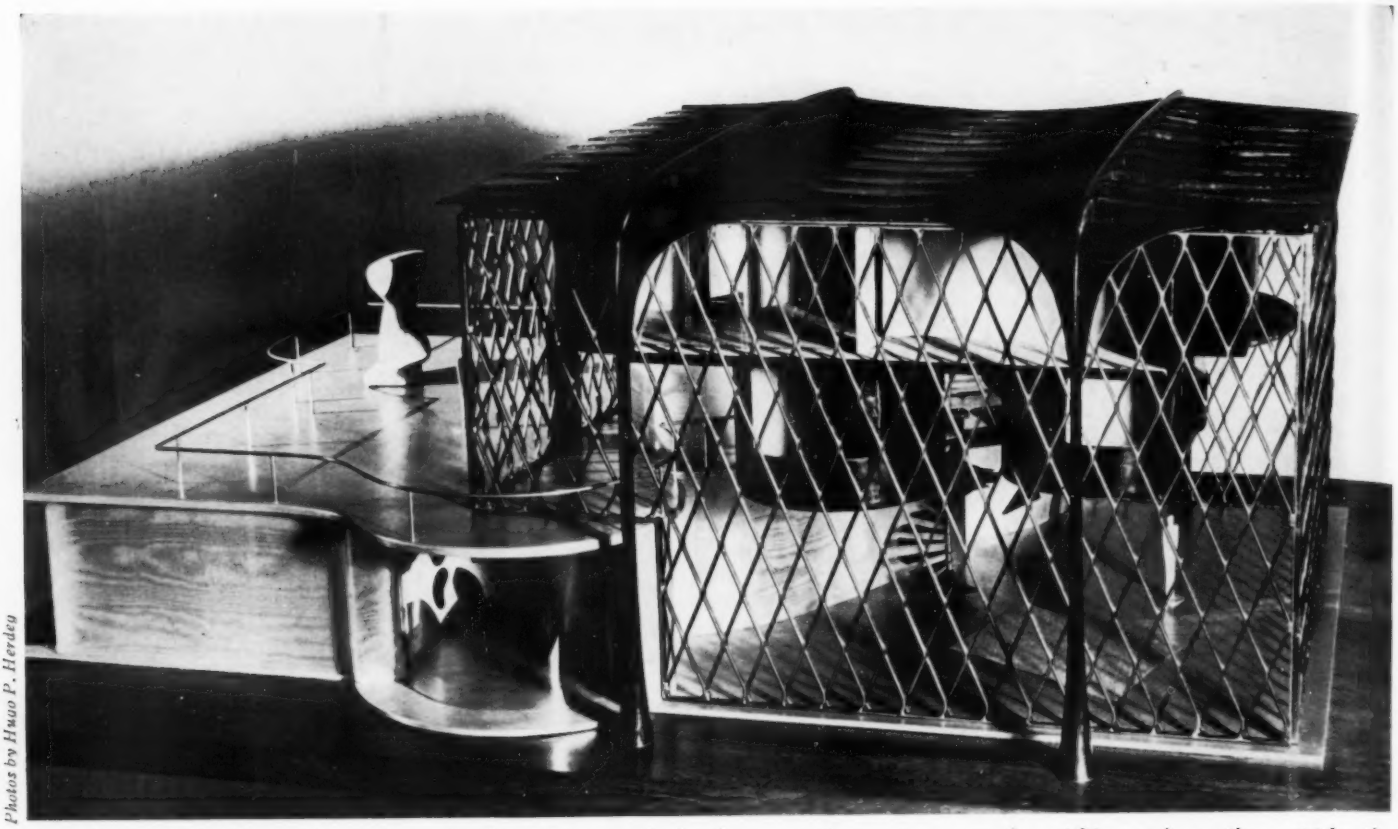


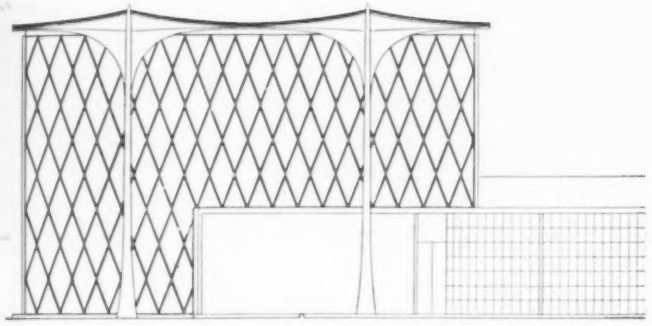
Photos by Hugo P. Herdeg

The Suspended House has three levels: at ground level, a service group, partly within and partly outside the closed form; at the top of the house, a habitation level; leisure space between and around the other two groups.

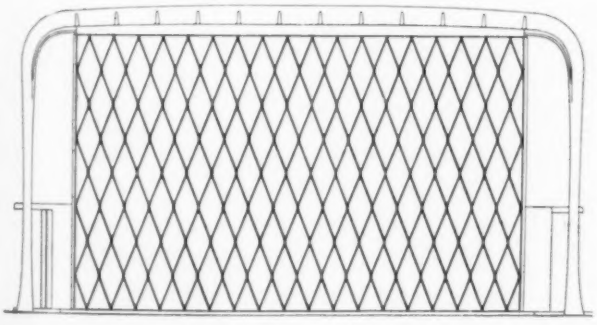
Elements of the leisure space are connected by a ramp, in itself a leisure - use form; contrast this with the direct and rapid connection between service and habitation groups provided by the main stairway.

NEW USE OF SPACE DETERMINES DESIGN OF PROPOSED HOUSE

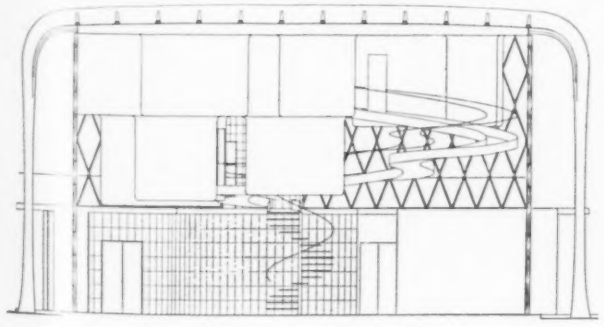
PAUL NELSON, Architect



North elevation



East elevation



Cross section

THIS, THE SUSPENDED HOUSE, has been designed "as a hypothetical research in architecture."

One consequence of this research is a new conception for the use of space. In the design of the Suspended House space is not conceived *primarily* as a function of the materials and labor-time used in the fabrication of an enclosing structure, therefore to be carefully economized. Neither is adaptability to industrialized production the driving consideration. Space—more specifically dwelling space—is, before all, conceived as the scene of human regeneration, for rest, for study, for leisure.

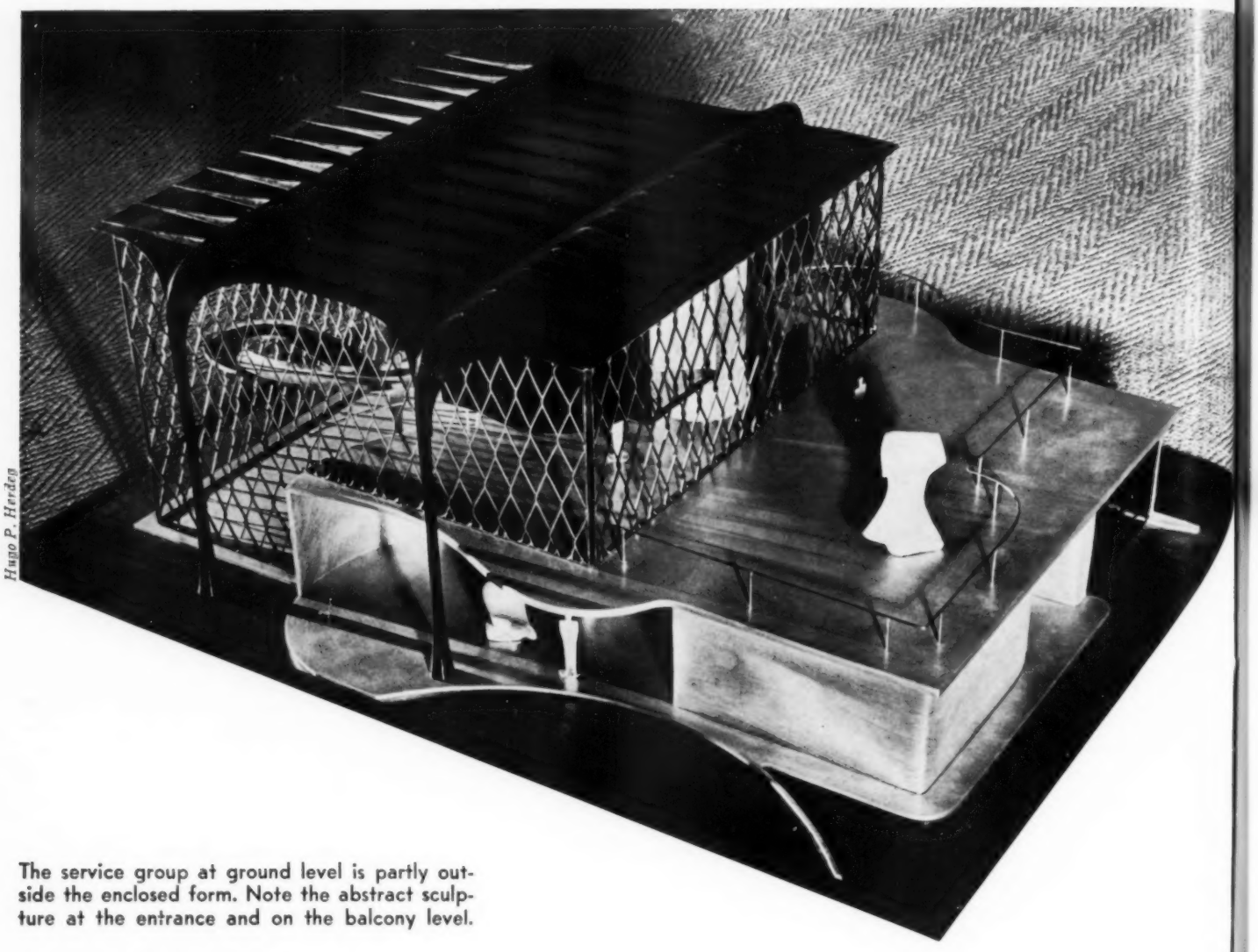
In this house, there is space to permit various degrees of intimacy and seclusion; to provide, within wider limits, a choice among alternatives; to allow greater flexibility for future changes; space in which the play and contrast of volumes and forms stimulate the senses. Nor does this mean that space is "wasted": on the contrary, in the service block and in other parts of the house which serve the basic human functions, there is a high concentration of useful space—through the use, for instance, of the Dymaxion bathroom. This concentration serves to release space for leisure activity.

To satisfy the need for privacy, the form of the house is closed; the design of the building develops within. Suspension permits a freedom of form and volume which contrasts sharply with the restrictions imposed by the traditional cubic room or by the usual arbitrary division of a house into "floors." In the Suspended House, there are no "floors"—there are levels: on the ground level, a service group, partly within and partly outside the closed form; at the top of the house, a habitation level suspended from the roof; recreation and study spaces between and around the service and habitation groups. On the upper levels, suspension in space heightens the sense of isolation from the outside world. Contrary to traditional practice, bathing, sleeping, dressing, and calisthenics are performed in distinct rooms on the habitation level, each specifically designed for the function its serves. A separate bedroom with bath and porch permits an alternative choice with the suspended sleeping cabin as well as for the use of guests and for use in the event of illness.

The suspension construction is of arc-welded tubular metal. Materials proposed for the service block are reinforced concrete and glass brick. On this level interior rooms are to be lighted from the terrace above. All other exterior walls are to be made up of diamond-shaped glass panes, each slightly inclined, giving to the whole an appearance of opacity; diagonal, rather than vertical or horizontal framing has been used, so that the walls, which are non-supporting, may not seem to be bearing walls. Suspended rooms are of continuous metal sheeting. The entire house is to be air-conditioned.

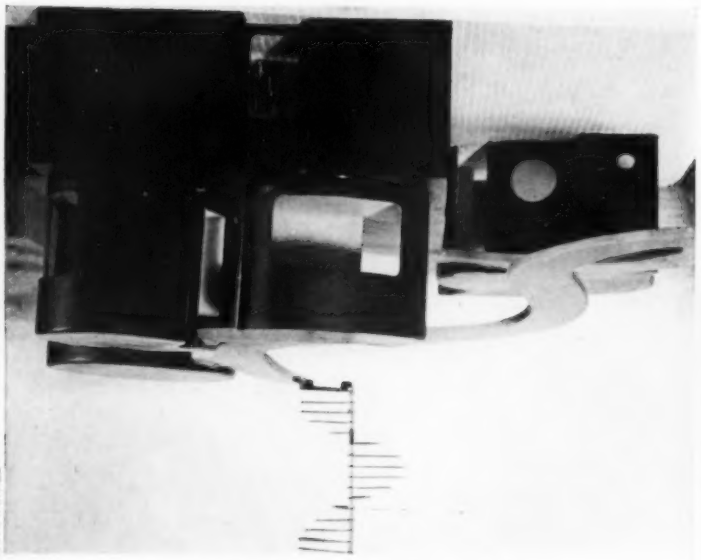
An attempt has been made to use painting and sculpture as an integral part of the design. Miro and Leger have painted abstract mural sketches for the reception room and dining room, and Arp has designed sculpture for the entrance and terrace.

The Suspended House, says Mr. Nelson, is "primarily a work of anticipation . . . (although) its design is such that it could be realized today."



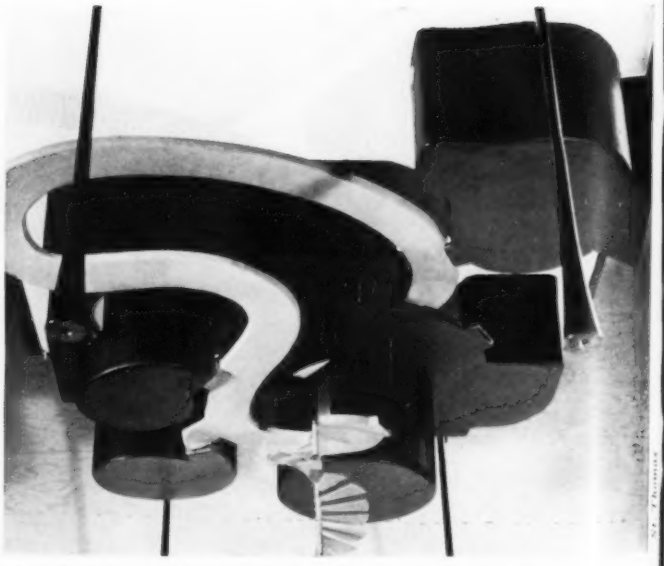
Hugo P. Herdeg

The service group at ground level is partly outside the enclosed form. Note the abstract sculpture at the entrance and on the balcony level.



St. Thomas

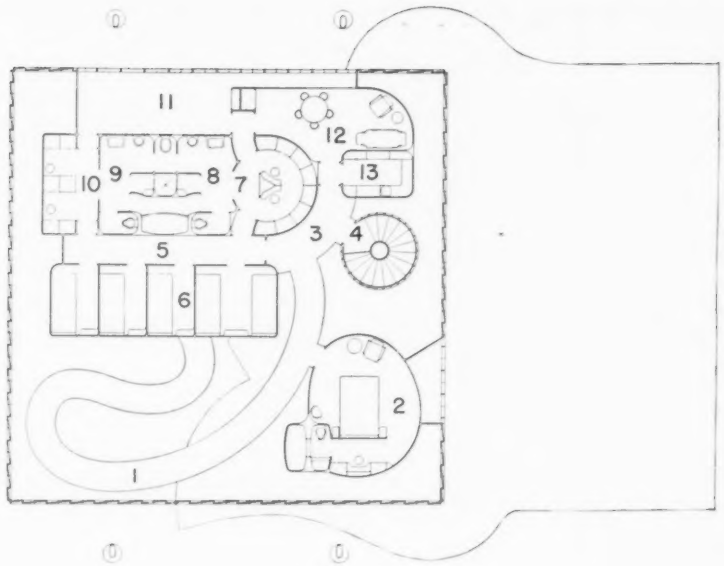
Suspension in space heightens the sense of privacy.



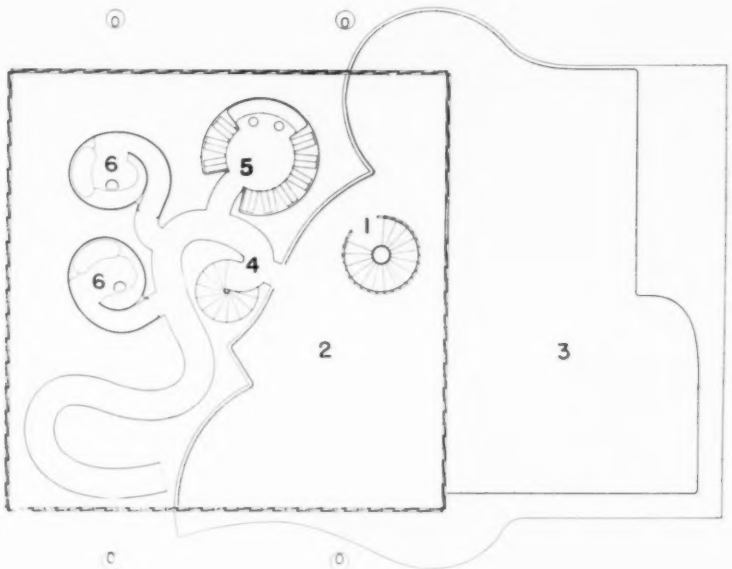
Continuous metal sheeting implies curved surfaces.

PROPOSED SUSPENDED HOUSE

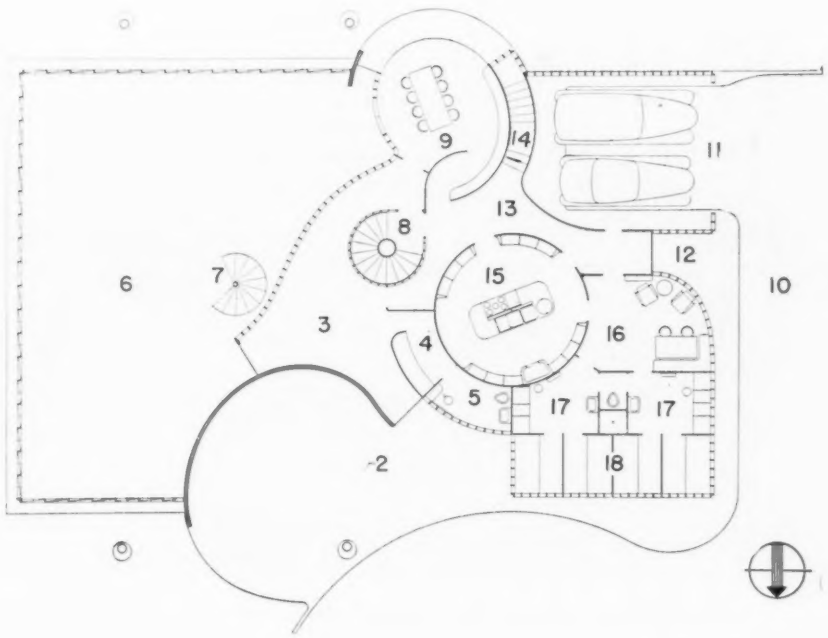
Top level: 1. Ramp. 2. Bedroom with dressing space, bath (Fuller), and porch. 3. Landing. 4. Main stairway. 5. Passageway. 6. One double and three single sleeping cabins. 7. Dressing room (women). 8. Toilet and bath (women). 9. Toilet and bath (men). 10. Dressing room (men). 11. Porch for calisthenics and sun-bathing. 12. Children's playroom. 13. Linen and cleaning utensils.



Intermediate level: 1. Main stairway. 2. Balcony for leisure and recreation, music, radio, television, games, etc. 3. Terrace. 4. Ramp. 5. Suspended library and writing room. 6. Suspended individual studies.

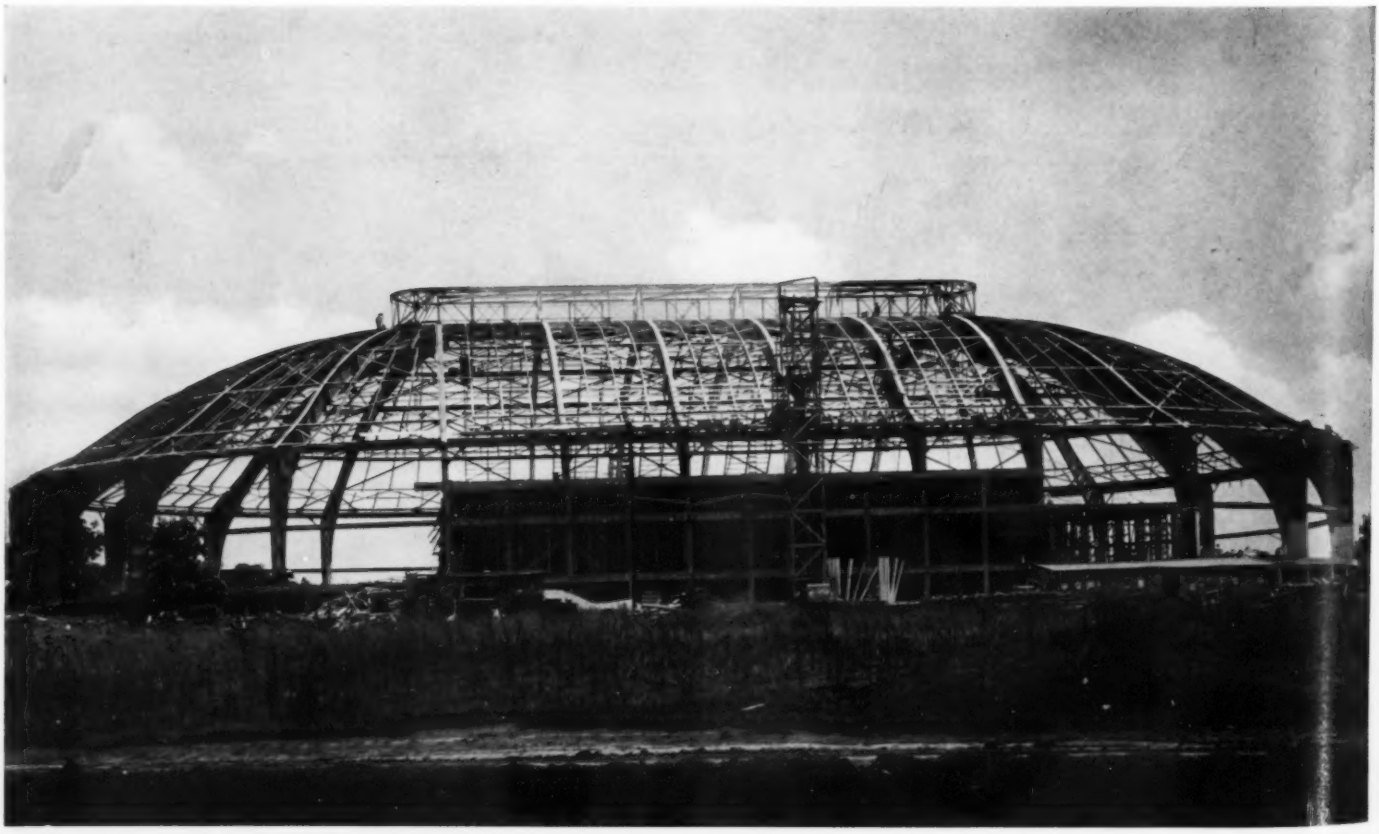


Ground level: 1. Main driveway. 2. Entrance porch. 3. Vestibule. 4. Coatroom. 5. Toilet. 6. Space for reception and family reunion. 7. Stairs to ramp. 8. Main stairway. 9. Dining room opening on reception and on garden. 10. Service driveway. 11. Garage. 12. Service entrance. 13. Service corridor. 14. Stairs to basement. 15. Kitchen. 16. Servants' dining room. 17. Dressing rooms, toilet, and shower. 18. Individual sleeping cabins.



Photos by Rembrandt Studio

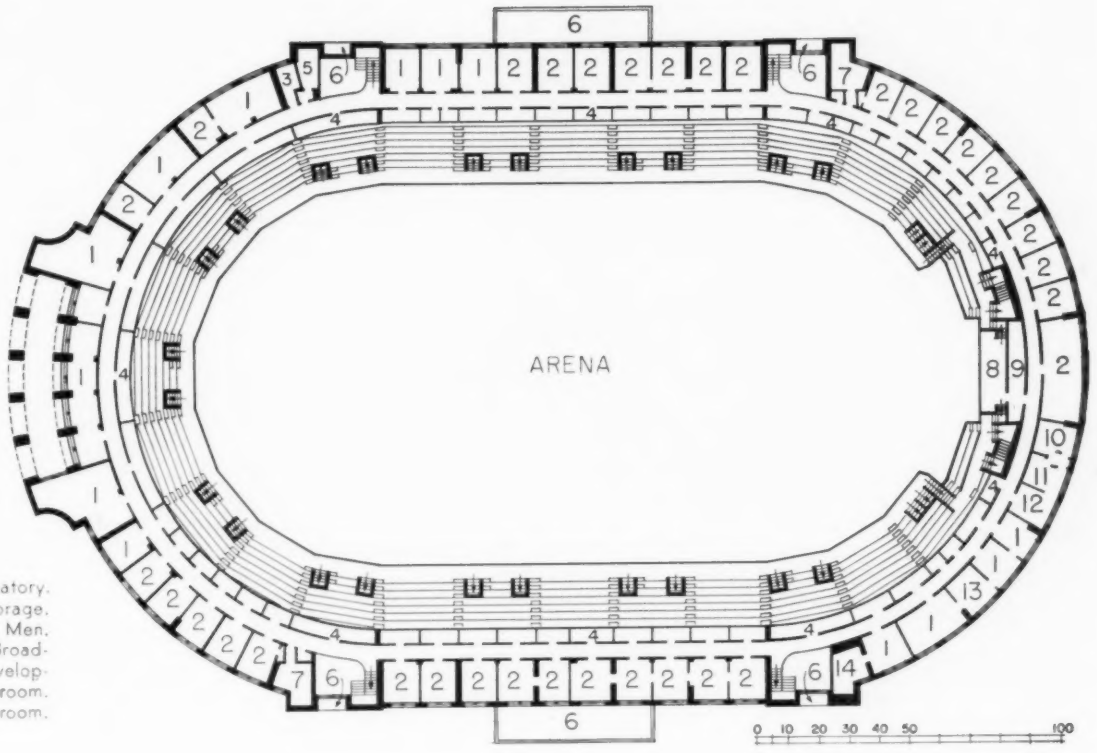
Agricultural Center Building, Baton Rouge, Louisiana. Laboratories and offices on the second floor enclose a clear-span arena.



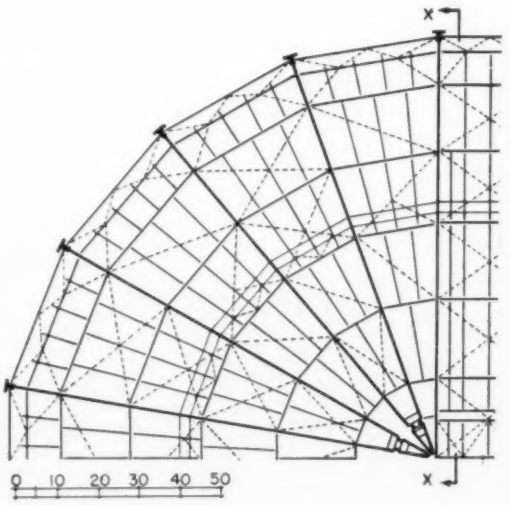
Steel rigid-frames, braced by six continuous truss-type cross frames, are used. Fan room is placed above the roof.

RIGID-FRAME CONSTRUCTION USED IN CLEAR-SPAN AUDITORIUM

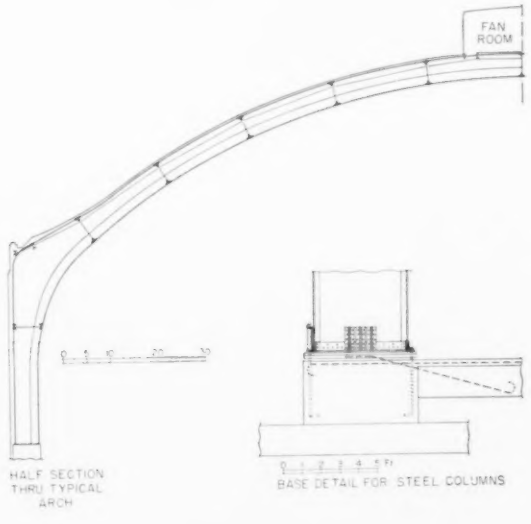
EDWARD F. NEILD, Architect



Second-floor plan: 1. Laboratory. 2. Office. 3. Women. 4. Storage. 5. Darkroom. 6. Marquise. 7. Men. 8. Observation platform. 9. Broadcasting control room. 10. Developing room. 11. Enlarging room. 12. Copying room. 13. Stockroom. 14. Cold storage.

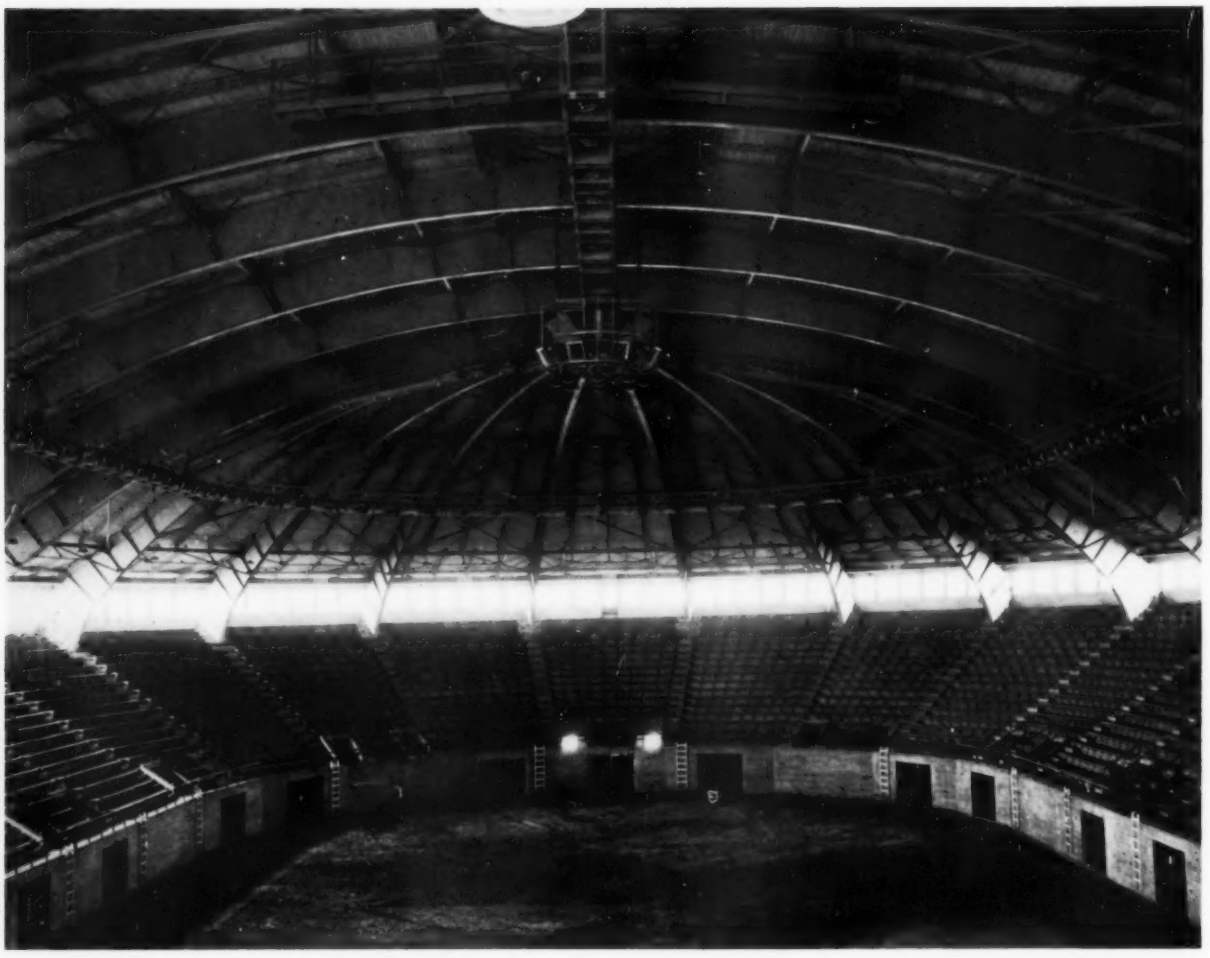


There are six lines of truss-type cross frames, spaced 20 ft. on centers. Each of the rigid-frames is an arch with five centers; reinforcing bars extending from base plates into floor system aid in taking horizontal arch thrust.



THE Agricultural Center Building of Louisiana State University at Baton Rouge is one of a new type of clear-span auditoriums using rigid frames of steel. The building has over-all dimensions of 349 ft. 4 in. by 219 ft. 4 in.; its height from the finished floor level to the bottom chord of the rigid frames supporting the roof is 76 ft. 8 in. Excepting catwalks, which are suspended directly from the steel, the building is completely clear of all bracing or obstruction below the bottom flanges.

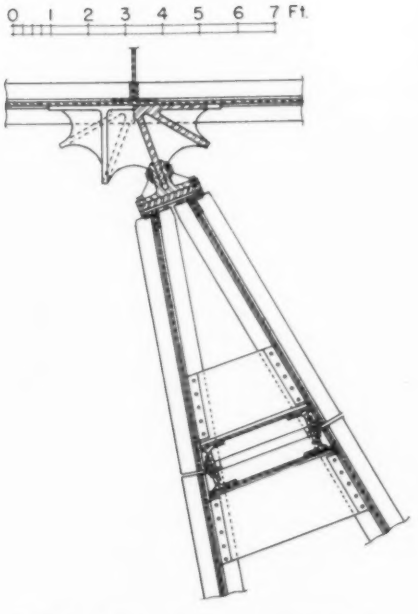
There are six transverse frames, each in the form of an arch with five centers. The column and arched sections are in the form of a plate girder 5 ft. deep. The knees of the frames are increased in depth to approximately 11 ft. deep. At either end of the building, eight radial half-frames of similar design connect to the last transverse arches and are spaced equally on a semicircle to form the half-dome end of the building. The horizontal thrust of the arches is carried by bars welded to the base plates and extended down into the reinforced-concrete floor. The rigid frames are braced by truss-type cross frames.



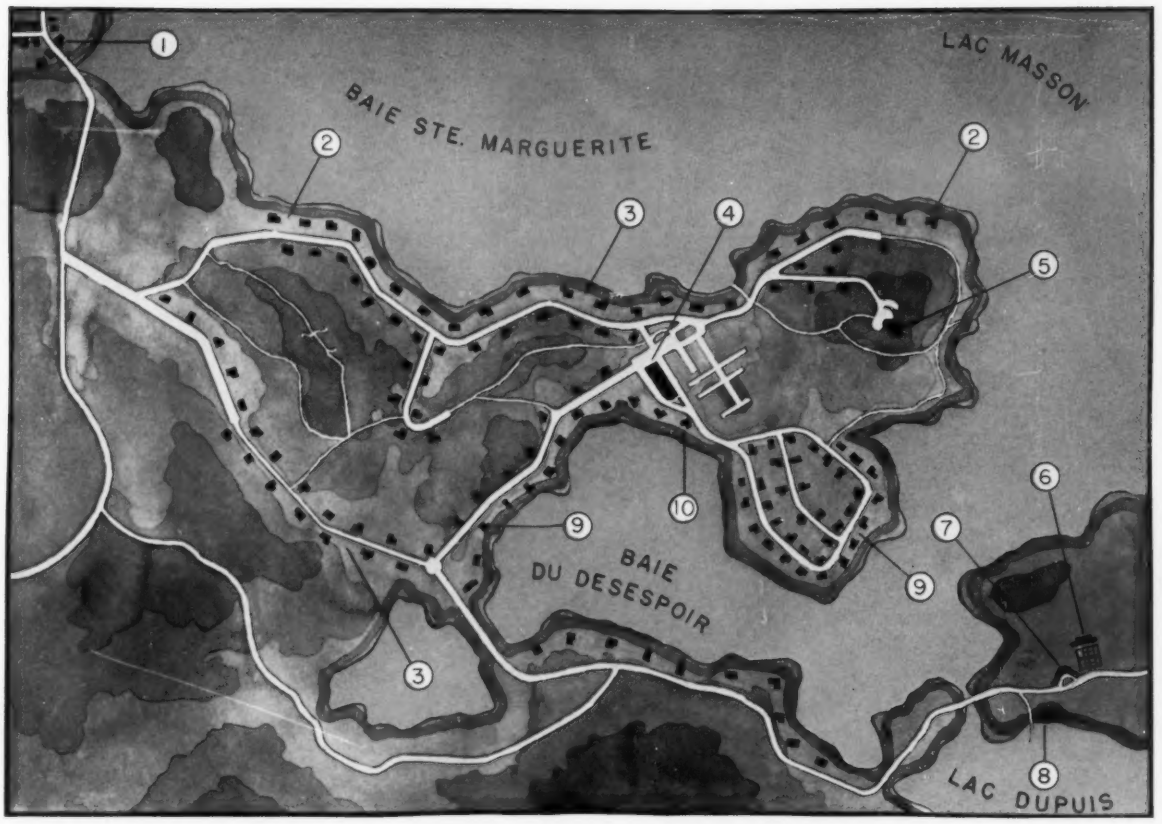
Photos by Rembrandt Studios

Interior view of auditorium. Behind the seats at the second-floor level are offices and laboratories.

View of construction showing the rigid frames and the systems of purlins and bracing used.



Detail plan showing connection of transverse and radial arches.



1. Village of Ste. Marguerite. 2. Log cabin area. 3. Modern cottage area. 4. Commercial center. 5. Hotel. 6. Tennis courts. 7. Riding school. 8. Clubhouse. 9. Rustic cottage area. 10. Air service.

7,000-ACRE RESORT BUILT IN CANADIAN WOODS

ANTOINE COURTENS and LOUIS NICOLAS, Architects

THE TOURIST TRADE is Canada's fourth largest industry. Until quite recently, however, the Laurentian country north of Montreal had no adequate tourist resort adapted to year-round activity and equipped for contemporary usage.

In 1935, a Belgian philanthropist, Baron Louis Empain, procured a vast territory some 60 miles northwest of Montreal. Here within the last three years has been built a sportsman's resort, the Domaine d'Esterel.

The Domaine occupies some 7,000 acres, bordering on Lac Masson; this is exclusive of sections reserved for hunting and fishing. In summer the lakes provide a wide range of water sports and beach games. For skiing, more than one hundred miles of trails have been mapped out and broken through the woods. The resort includes a community center, clubhouse with tennis courts and stables, a hotel, an airport, dwelling facilities for employees, and a number of log cabins built on the lakeshore: in brief, an integrated community in the heart of the Canadian woods. The resort can be reached from Montreal by train, bus, automobile or plane.

With minor exceptions, the larger structures are of reinforced concrete, with exterior walls of steel-stud framing, covered with stucco on metal mesh.

The community center is located in the approximate middle of the district, conveniently near the hotel. The main floor of this building includes some 30 shops, which enclose a garage with repair shop and other necessary services. Enlargement of the community center by the erection of additional buildings is projected for the future.

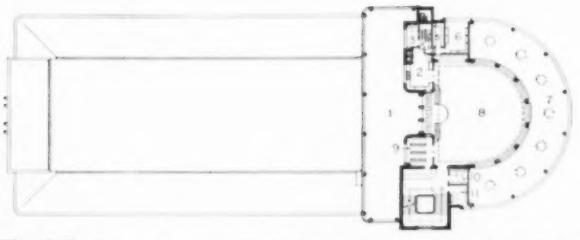
The clubhouse is constructed on piles which extend into Lac Dupuis. Its dressing rooms can be used by 1,500 to 2,000 bathers daily. Two solarium balconies, connected by outside stairways, accommodate 300 to 400 people. From one of these balconies, guests can reach the diving boards and towers on the pier, which extends out into the lake. Tennis courts and public grandstands have been built near the clubhouse. And not far away are stables, riding school, and bridle paths into the enclosing forest.

The hotel is located on a rocky promontory which juts out into the lake; it is surrounded by terraces which command a spectacular view of the lakes and the Laurentian woods which stretch for miles in every direction.

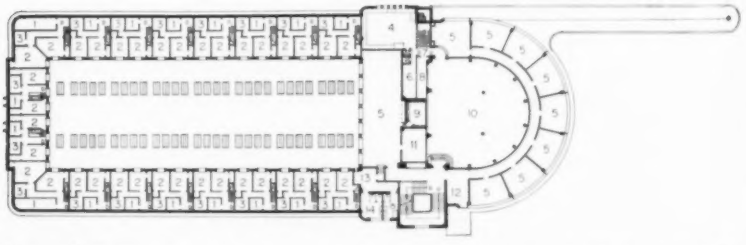
COMMUNITY CENTER AT DOMAINE D'ESTEREL

E. W. Bennett

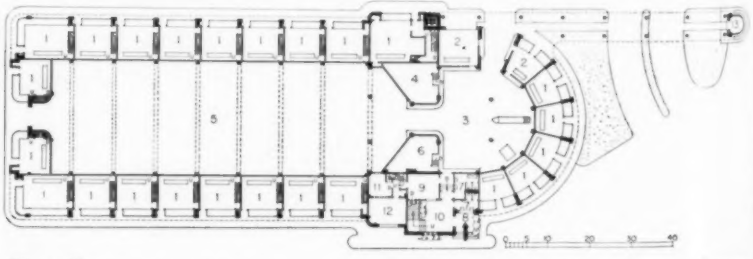
Behind the continuous vertical glass is a stairway leading to a cinema on the second floor and a restaurant on the third. The restaurant windows and the terrace opposite command a view of the surrounding woods and lakes.



Third floor: 1. Terrace. 2. Pantry. 3. Servants' toilet. 4. Service stair. 5. Servants lockers. 6. Storeroom. 7. Blue Room. 8. Restaurant. 9. Coatroom. 10, 11. Toilets.



Second floor: 1. Storeroom. 2. Bedroom. 3. Bathroom. 4. Kitchen. 5. Office. 6. Cold storage. 7. Service stair. 8. Storage. 9. Projection booth. 10. Theater. 11. File room. 12. Waiting room. 13. Coatroom. 14. Women's room. 15. Men's room.



First floor: 1. Store. 2. Garage store. 3. Auto repair. 4. Auto parts. 5. Garage. 6. Electrical materials. 7. Toilet. 8. Porch. 9, 10. Halls. 11. Kitchen. 12. Supt. 13. Gas

Bennett

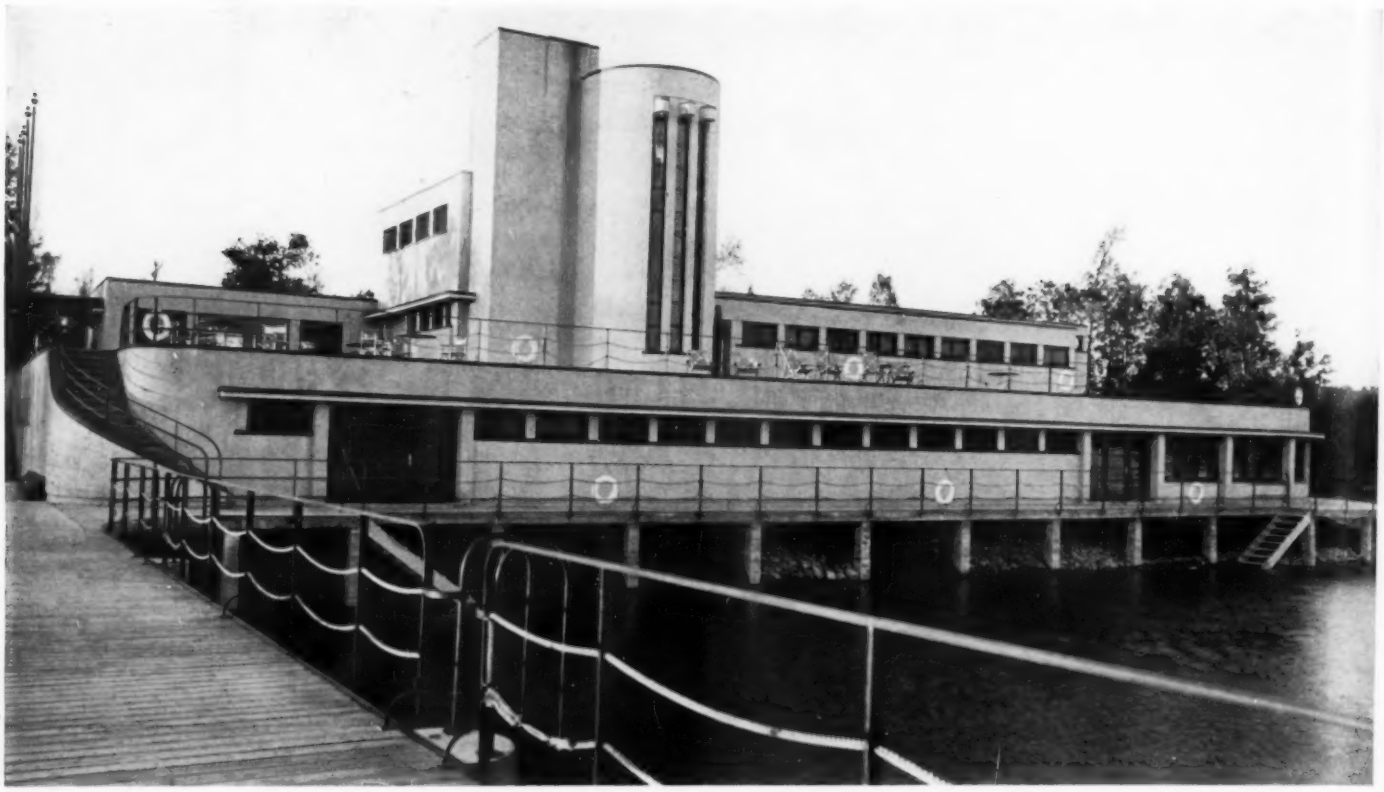
Northeast end: Offices on second floor with cinema behind; restaurant and ballroom on third.

Bennett

Restaurant, third floor; note orchestra stand at left and clear space for dancing.

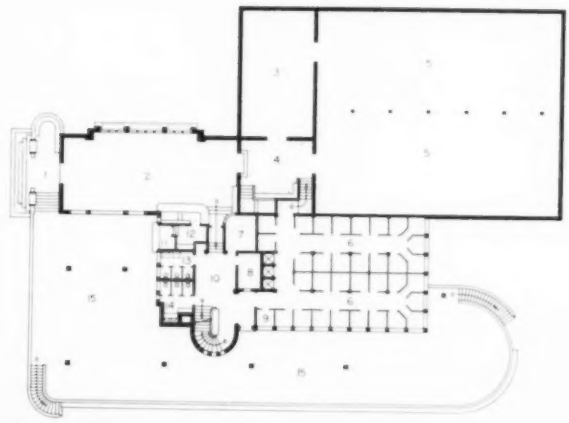
Third-floor terrace; the restaurant and dance floor are accessible through entrance at right.

CLUBHOUSE AT DOMAINE D'ESTEREL



Photos by Bennett

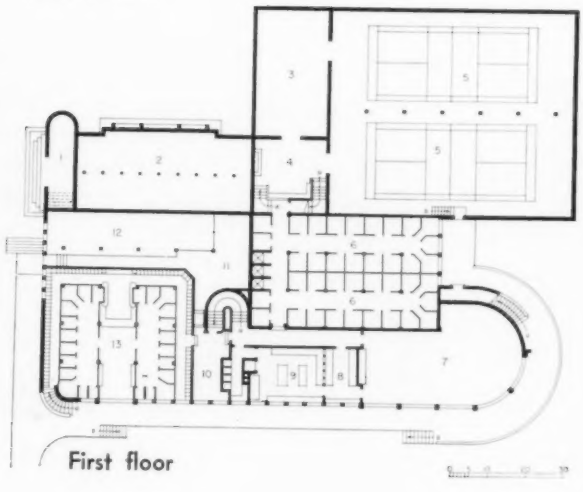
The structure is built on solid rock. Entrance opens on a lounge, with gymnasium, badminton courts, and dressing rooms beyond; the latter can accommodate 1,500 to 2,000 persons daily.



Second floor

Second floor

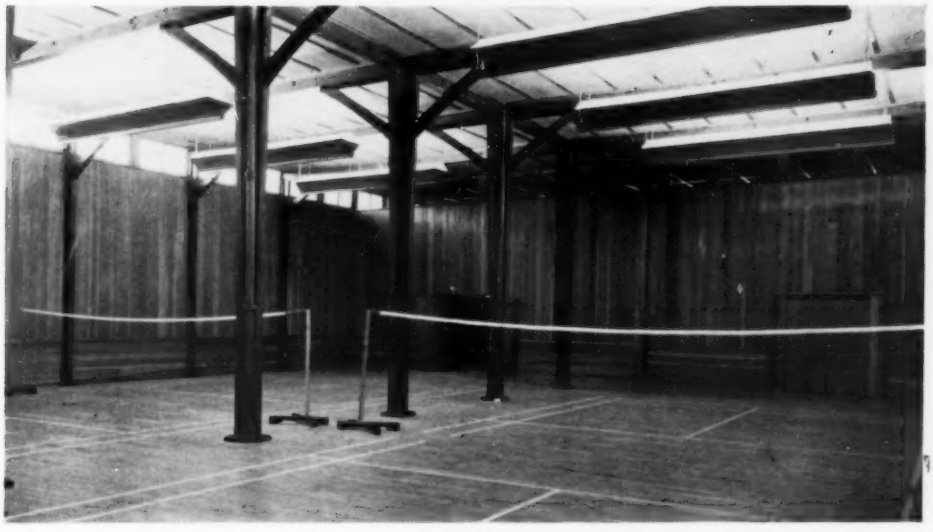
1. Porch
2. Lounge
3. Gymnasium
4. Hall
5. Badminton court
6. Dressing rooms
7. Office
8. Coatroom
9. Linen room
10. Stair hall
11. Bar
12. Pantry
13. Women's room
14. Men's room
15. Terrace



First floor

First floor

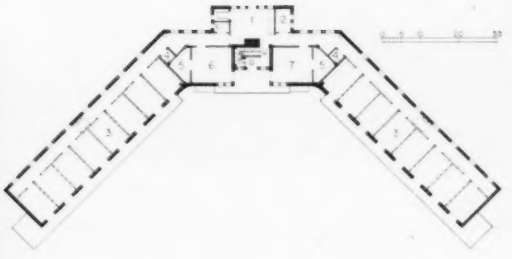
1. Porch
2. Unexcavated
3. Gymnasium
4. Hall
5. Badminton court
6. Dressing rooms
7. Dining room
8. Pantry
9. Kitchen
10. Pumping station and filters
11. Heating
12. Fuel room
13. Locker room



Above, right: Bar in lounge just inside the entrance. Beyond this lounge are gymnasium, badminton courts, and dressing rooms. Lower, right: Badminton courts are two floors in height.

RIDING SCHOOL AT DOMAINE D'ESTEREL

Riding school, stables, and bridle paths are located near clubhouse.

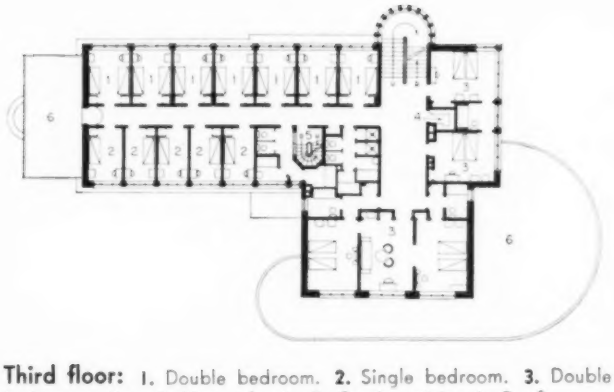


Ground floor: 1. Kitchen. 2. Fodder. 3. Stall. 4. Chute for oats. 5. Storage. 6. Stable boys. 7. Saddle room.

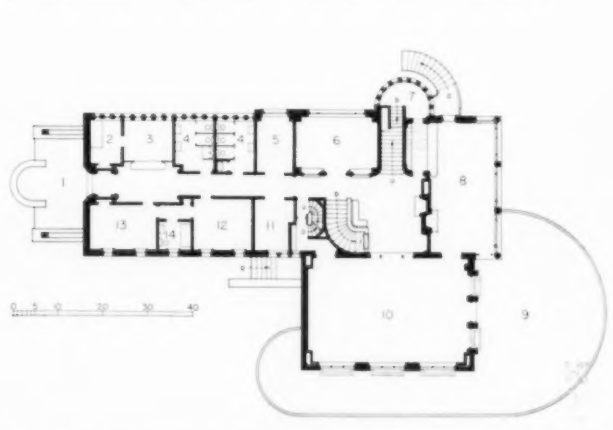
HOTEL AT DOMAINE D'ESTEREL

Bennett

The hotel is built on a rise of ground, and its terraces command panoramic views of the forest and lakes. It is situated on a rocky promontory which juts out into a lake. The hotel is within easy access of the commercial center and of the other community buildings.

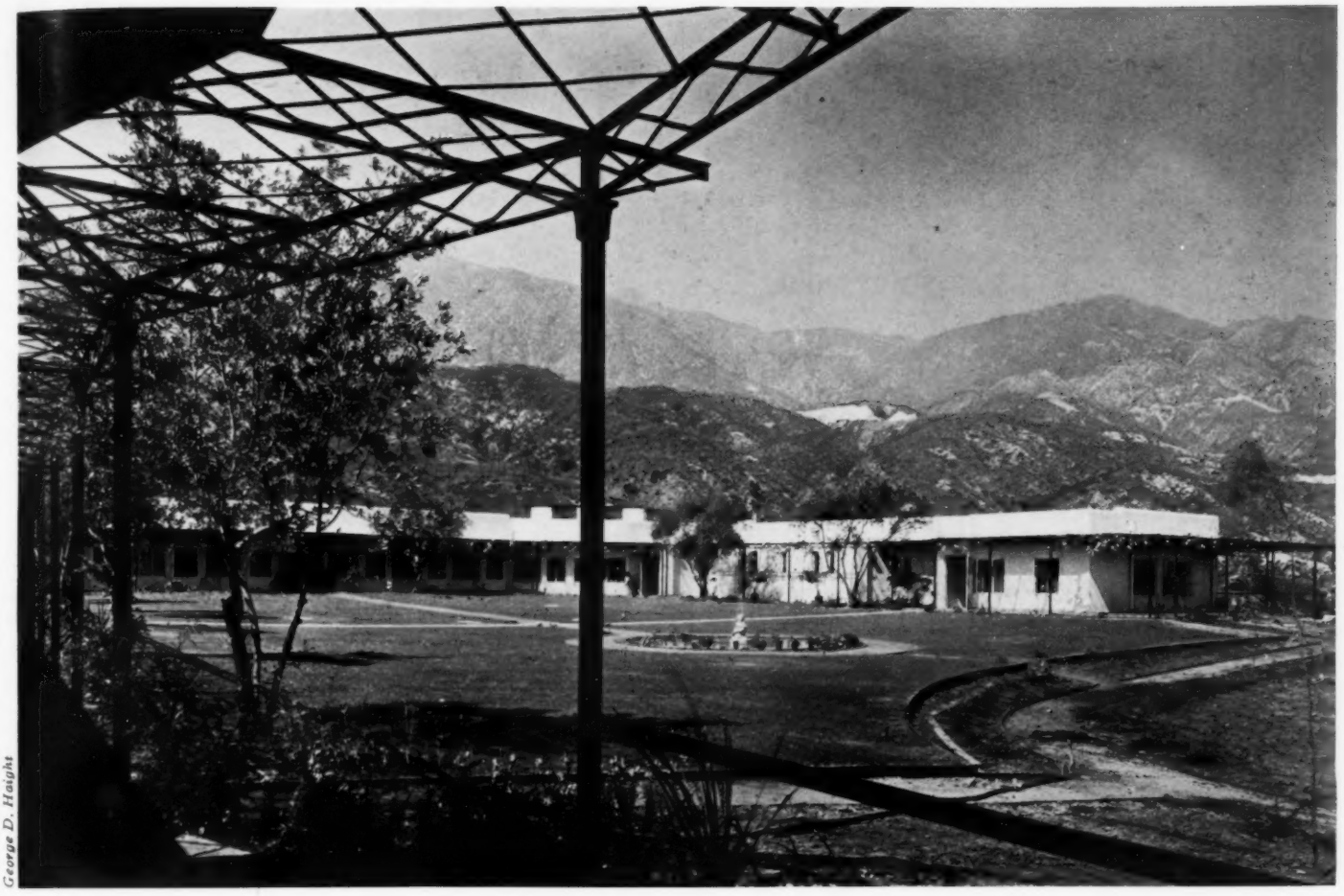


Third floor: 1. Double bedroom. 2. Single bedroom. 3. Double bedroom suite. 4. Linen closet. 5. Service stair. 6. Roof.



First floor: 1. Porch. 2. Bedroom. 3. Supt. 4. Washroom. 5. Reading. 6. Games. 7. Bar storage. 8. Bar. 9. Terrace. 10. Lounge. 11. Coatroom. 12. Mgr.'s office. 13, 14. Mgr.'s bedroom and bath.

George D. Haight



George D. Haight

SANATORIUM DESIGNED FOR HILL SLOPE IN EARTHQUAKE COUNTRY

MYRON HUNT and H. C. CHAMBERS, Architects

THE LA VIÑA TUBERCULAR SANATORIUM near Altadena, California, is situated on one of the foothills of the Sierra Madre Mountains, overlooking a broad plain.

The structure has been designed in the form of a modified U, the arms extending southward. All patients' rooms are on the east end of corridors, facing the morning sun; men's and women's wings do not face each other. Terrain for a mile or so south of the site is an alluvial fan with a gentle slope away from the mountains, the arms of the building extending in the direction of the slope. But the length and evenness of this slope, in combination with the rugged mountains behind, create the illusion that the terrain is level; so that level structures of considerable length appear to be tilted backward toward the mountains. To mitigate this distortion, the sanatorium floors are made to follow the contour of the ground: each successive room is two inches lower than its neighbor to the north; corridors drop two inches between each room door. Despite the marked difference in elevation of the wing ends, however, the building appears level from the outside and within.

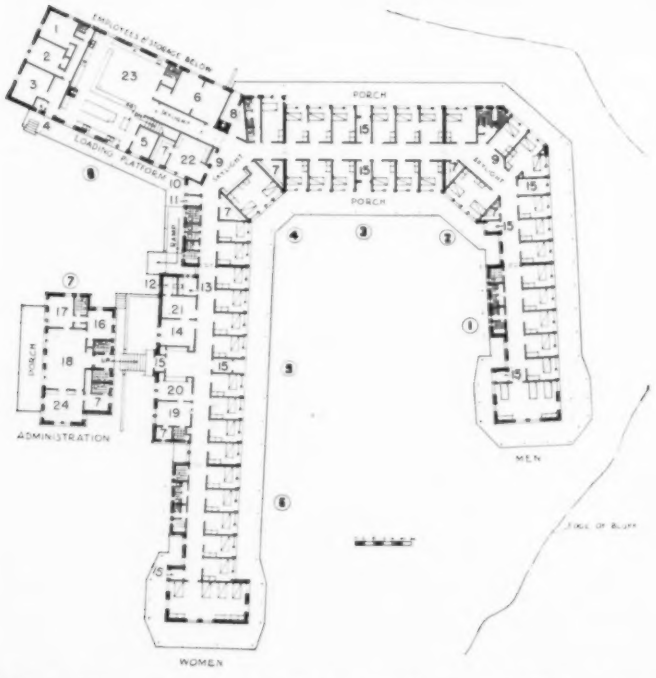
This moulding of the structure to the terrain is carried further in the design of the parapets: these not only step downward to conform to the sloping foundations, but exceed this pitch, being considerably higher above roof level at the north than at the south end of the arms. This sloping of corridor and parapets permits occupants of rooms deep in the courtyard of the U to enjoy virtually as much view of the valley as those in rooms near the wing extremes.

Earthquake resistance is essential: the sanatorium site is close to one and between two other important earthquake faults; further, quake undulations are particularly severe on long structures. The wings, therefore, are broken into units, each separate from those adjoining; space between units is about three inches, but continuity of walls and ceilings is maintained by slip-joint connections; each unit has its own foundation. In an earthquake, each unit will rock independently of the others, like one of a string of barges in a heavy sea. A concrete-beam foundation system is used. Floors are laid directly on the ground.

Each patient's room opens onto a trellis-shaded porch with macadam floor. Doorways are 4 ft. wide, so that beds may be moved easily to the porch. The pergola is formed by a continuation of the structural skeleton of the building beyond the exterior walls.

In conformity with the quiet background desired, colors are inconspicuous. Exterior walls are painted eggshell white; exposed steel work in the pergolas is deep blue; interior walls are an English gray.

Photos by George D. Haight



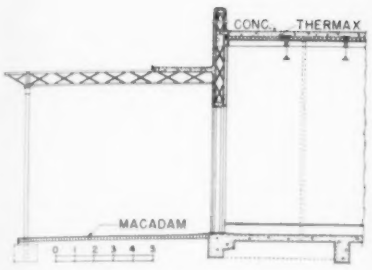
Floor plan: 1. Cook's room. 2. Asst. cook's room. 3. Kitchen storage. 4. Janitor's closet. 5. Men's dining room. 6. Nurses' and women patients' dining room. 7. Stores. 8. Janitor's room. 9. Nurse's station. 10. Ambulance vestibule. 11. Stretcher. 12. Darkroom. 13. Laboratory. 14. Surgery. 15. Vestibule. 16. Examination room. 17. Doctor's room. 18. Reception room. 19. Head nurse. 20. Office of head nurse. 21. X-ray room. 22. Linen. 23. Kitchen. 24. Office.

The circled numbers indicate the units of the building, separated for earthquake resistance; units are connected by three-inch slip-joints.

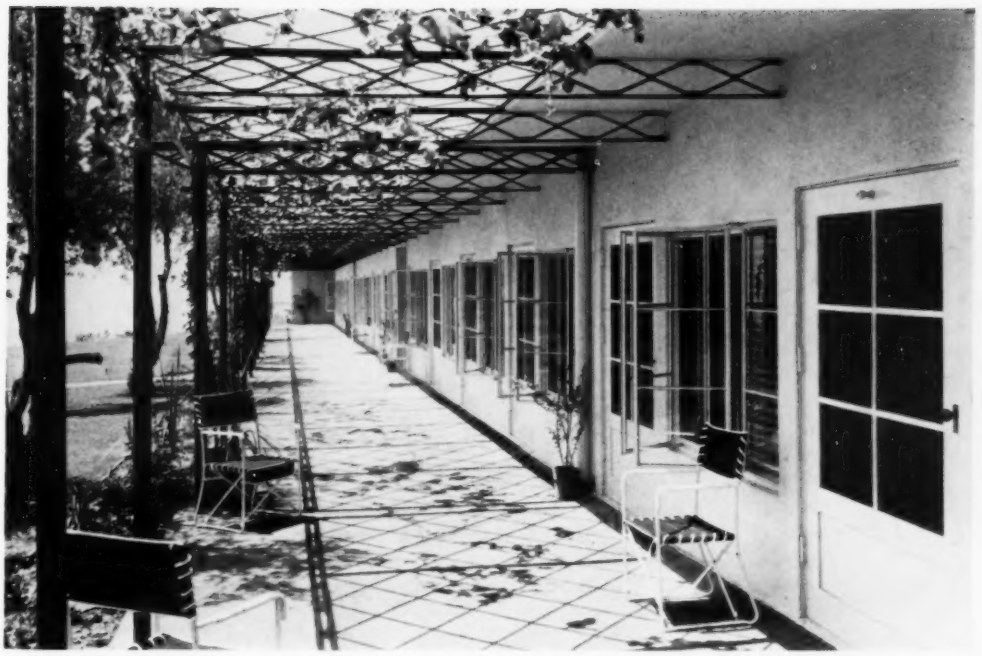
THE LAYOUT is determined by requirements peculiar to a sanatorium. Corners of the U are broken so that no more than two nurses' stations, properly placed, are needed to cover every room. Floor areas are so articulated that administrative and other work areas are removed from the patients' attention. These areas are placed on the west side of corridors, and no patient's room faces in that direction. All entrances are hidden not only from patients' rooms but from the exercise areas for ambulatory patients as well: visitors enter through the reception room in the administration building; ambulance entrance and merchandise delivery loading platform are in the motor courtyard formed by administration building and kitchen wing. Thus the plant can be operated without disturbance of patients.

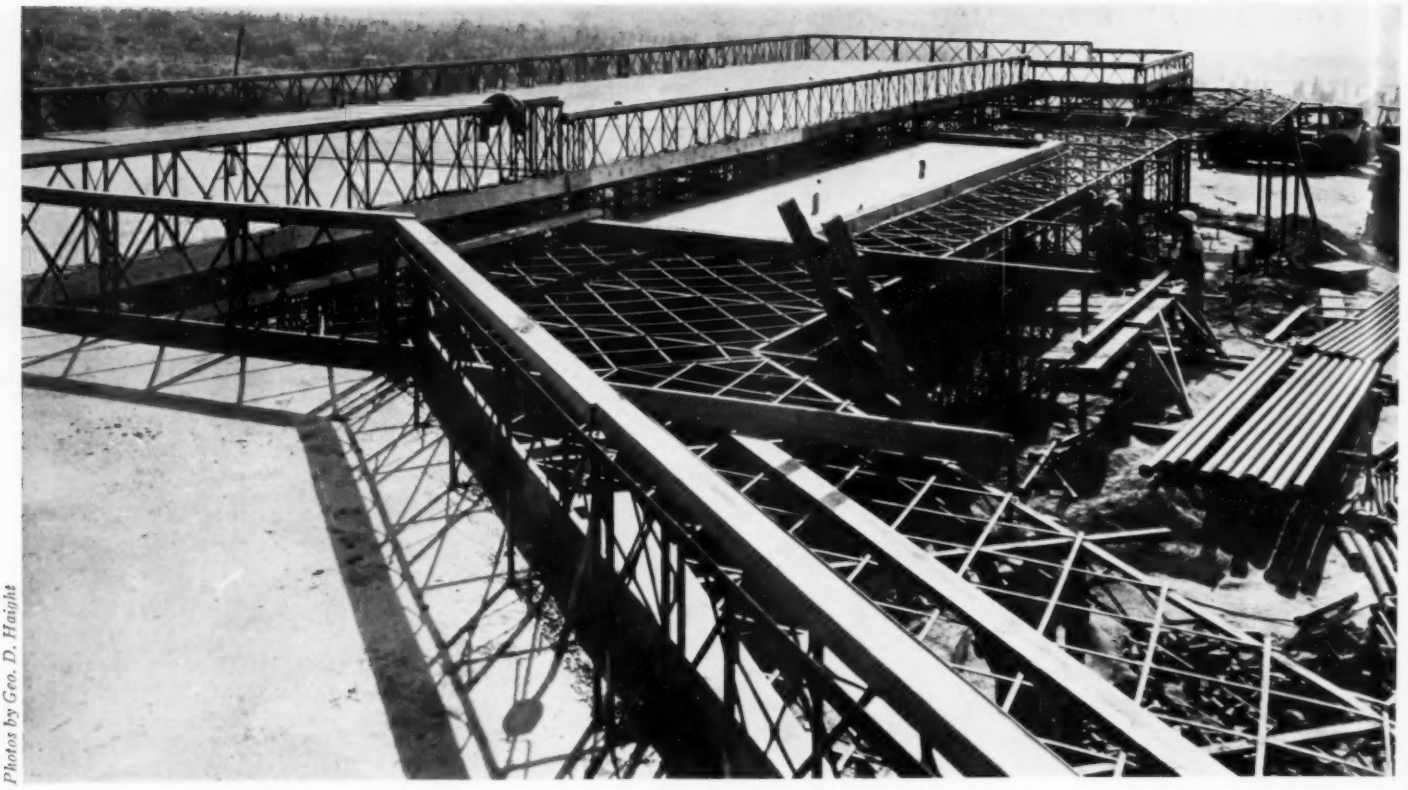
Almost all rooms contain but a single bed; only patients well advanced toward recovery occupy multiple-bed wards in company with others. This need for seclusion has encouraged several aspects of plan that are ordinarily considered disadvantages: the long corridors with rooms uneconomically placed along only one side; the small, rarely used dining rooms; the remotely situated toilets. Since 85% of the patients are bedridden, eating, bathing, and other functions must be performed in bed, so that adjoining toilets are unnecessary. Centralization of toilets permits centralization of plumbing, and leaves the entire easterly face of the wings available for patients' rooms.

LA VIÑA SANATORIUM



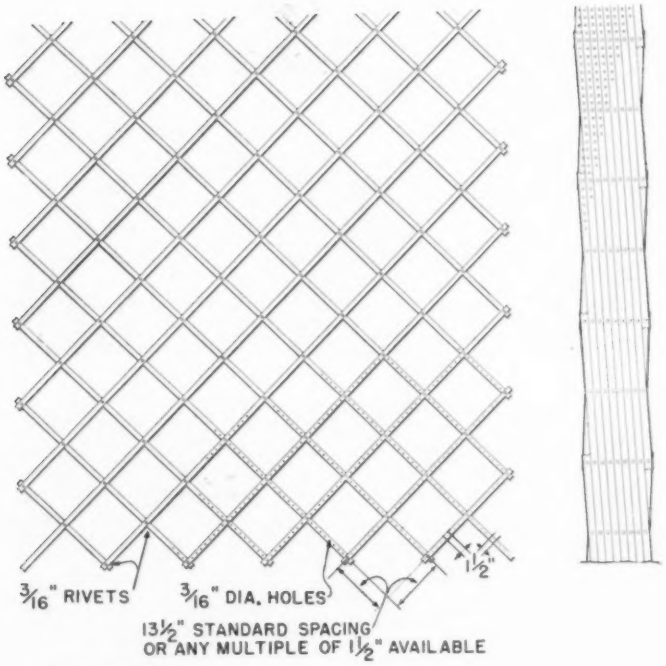
The pergola is a continuation of the structural skeleton beyond the exterior walls of the sanatorium.

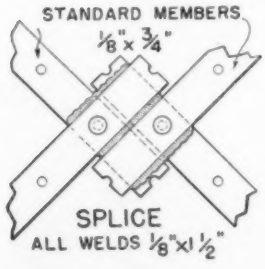




Photos by Geo. D. Haight

The flat roof is laid on Latisteel rafters. A continuous air chamber between ceiling and roof affords insulation.





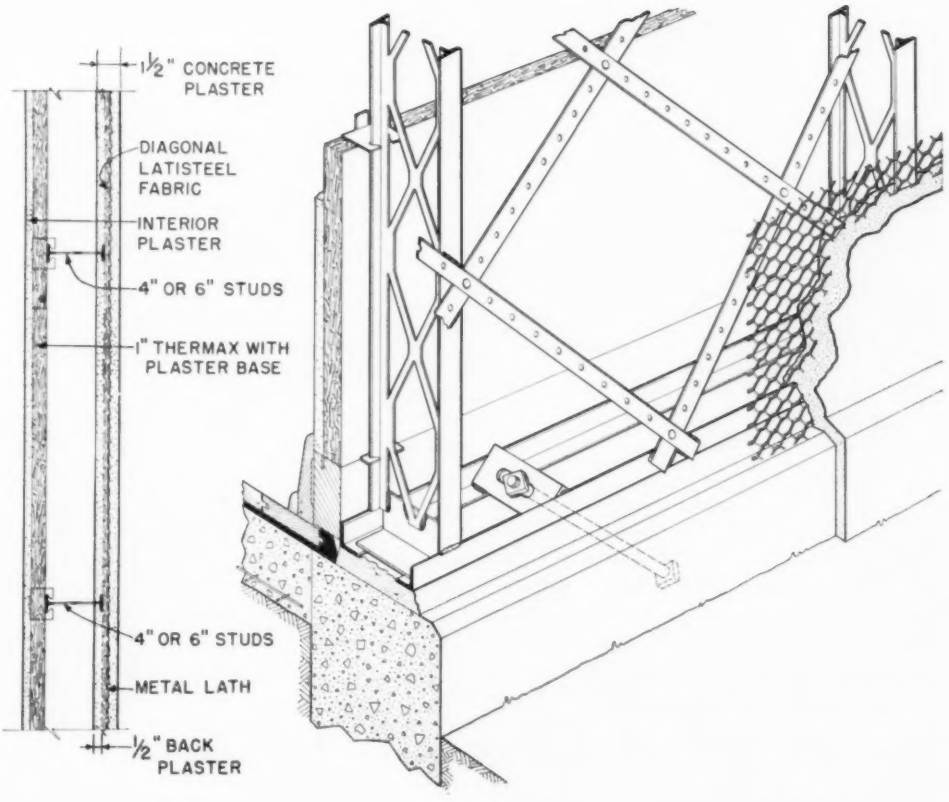
The diagonal steel-strip latticing can be "expanded" like metal lath; all joints and connections are welded. In this way the wall framing is trussed and made relatively rigid and integral with the other materials.

THE BUILDING is of Latisteel frame construction: light in weight, relatively inexpensive, fireproof, termite-proof, and easily adapted to thermal and acoustic insulation. The light weight simplifies foundation problems and aids earthquake resistance. The system consists essentially of one-piece "hot expanded" webbed steel studs, braced with diagonal steel-strip latticing which can be "expanded" like metal lath; all joints and connections are welded. Thus the wall framing is trussed and made rigid.

Metal lath is wired to the exterior face of the steel latticing, covered front and back with cement plaster, and finished with a brush coat of stucco. Thermax insulating plaster base is applied across the interior face of studs, then plastered. The flat roof is laid on Latisteel rafters. Above the rafters is a layer of Thermax insulation covered with "lightweight" aggregate three-inch cast-concrete slab, topped with tar and gravel. Ceilings are suspended from the rafters and are faced with acoustic plaster. The continuous air chamber between interior and exterior wall surfaces and between ceiling and roof, together with Thermax and acoustic plaster, afford relatively high sound and heat insulation. All utilities are carried in the wall spaces afforded by the expanded studs and joists.

No inflammable materials are used on the exterior: the pergola is steel, and the door and window sash are metal. This is an important consideration because brush fires have been common in these foothills; the present structure replaces one destroyed by a brush fire two years ago. As an added precaution, steel windows and exterior doors nearest the brush-covered slopes are glazed with wired plate glass.

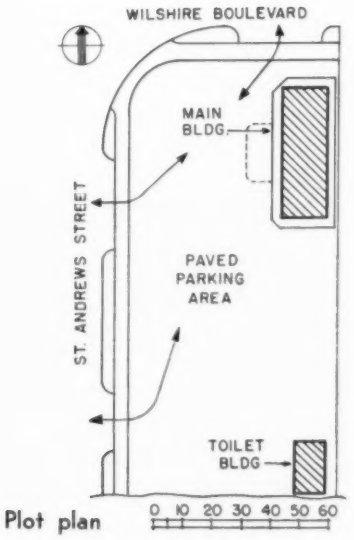
LA VIÑA SANATORIUM



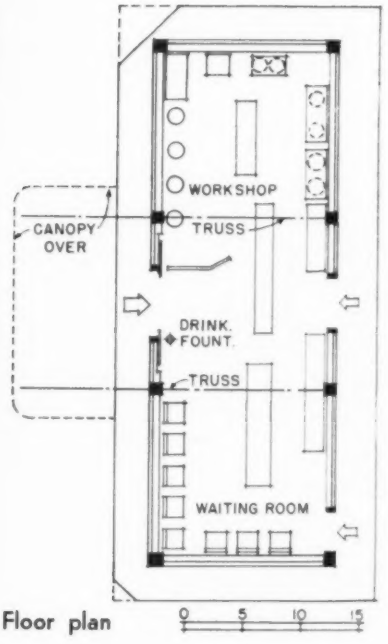
COMBINED SHOWROOM AND WORKSHOP FOR MOTORIST PATRONS

HAROLD O. SEXSMITH, Architect

Photos by Miles Berne



Plot plan



Floor plan

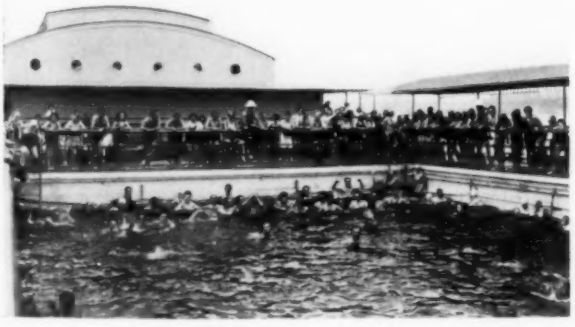
ALONG WILSHIRE BOULEVARD in Los Angeles (see AR, 11/38, p. 43) there has recently been built a "drive-in" shoe-repair shop. Here customers can motor in, sound their horns for service, and wait in their cars while worn footwear is repaired. A small waiting room is provided inside the structure.

For reasons of showmanship, the workshop is in plain view of passersby and customers: all walls are glassed, with work benches facing the boulevard and parking area. To keep the showroom-workshop clean, a 2-hp. rotary fan is installed in the basement, drawing leather dust and particles from the machines, collecting it in a cloth bag. The building is a steel-frame structure, faced with concrete. The interior is faced with plywood. Ventilation is provided through louvers close under the roof overhang.

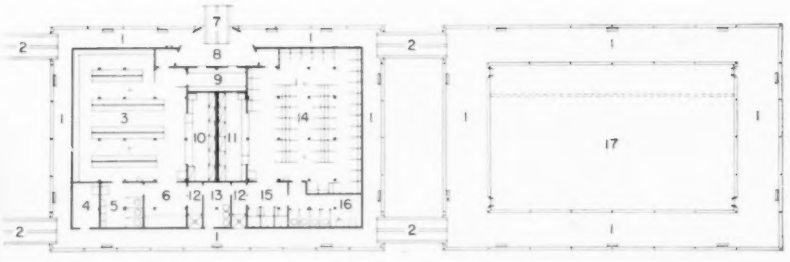
The owner of this drive-in shop, a chain shoe-repair organization, is planning additional units.

ANTIQUATED BARGES BECOME FLOATING POOLS AND BATHHOUSE

MADIGAN & HYLAND, Engineers



One of the floating pools which flank the bathhouse . . .



1. Promenade. 2. Gangplank. 3. Men's dressing room. 4. First-aid room. 5. Men's toilet. 6. Men's shower. 7. Gangplank to dock. 8. Entry. 9. Office. 10. Men's basket room. 11. Women's basket room. 12. Shower passage. 13. Chlorination room. 14. Women's dressing room. 15. Women's shower. 16. Women's toilet. 17. Bathing area.

One of the barges before modernization began . . .

THREE ANTIQUATED barge-pools owned by New York City's Park Department have been redesigned: two of them, superstructures removed, have become outdoor pools, joined by gangplanks to a third barge between them; the latter—rebuilt—is now a floating bathhouse. Pontoons support all three structures—wooden pontoons under the pools, thousand-gallon steel ones under the bathhouse. Copper paint is applied to the wooden walls and floor of each pool, and—below water level—to the outside surface of the barges; this paint reacts with water to form an acidic coating which prevents the adherence of barnacles. Because of the pressure of the river, the pools are never emptied during the swimming season; they are vacuum-cleaned. Bathhouse flooring is plastic magnesia—nonslippery, waterproof, and easily cleaned. The cost of this project was $50,000.

1

2

3

4

5

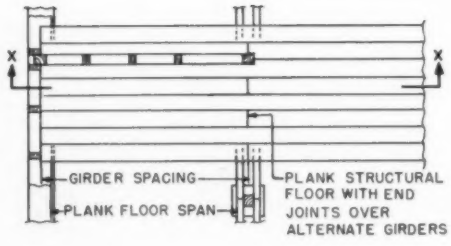
1. Stones are laid in form, flat face down; reinforcing bars are laid over.
2. After concrete is poured into the form, furring strips are bolted to the inside face of the wall section.
3. Wall is raised into position by crane.
4. Projecting chimney and wall cast in one piece are now in position.
5. The assembly is now complete.

Walls built in horizontal forms and raised to position

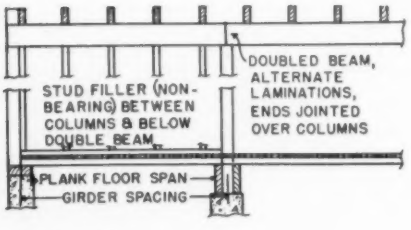
A SYSTEM for the construction of masonry walls, claimed by its sponsors to result in savings of 10 to 15%, has been developed by Form-U-Lay Homes, Inc., of Cleveland, Ohio. By this system both foundation walls and walls above foundations are built in forms on the ground and raised to position by cranes.

First, a horizontal concrete form is placed adjacent to the foundation footing; reinforcing bars are laid and the concrete poured. After hardening, the wall is tilted vertically into position on the foundation footing. Then, concrete is poured in the corners to lock the ends. Side walls are fabricated in the same way.

Other masonry materials may be used: stone was used, for instance, in the house illustrated at left. The mason laid the stones flat face down, leaving space for deep wide joints when the concrete was poured. Four inches of stone and four inches of concrete give a total wall thickness of eight inches. Furring strips are bolted to the inside face of the form. The projecting chimney of the house was cast in one piece with the wall. Corners are fabricated separately to seal the ends.



Plan


STUD FILLER (NON-BEARING) BETWEEN COLUMNS & BELOW DOUBLE BEAM
DOUBLED BEAM, ALTERNATE LAMINATIONS, ENDS JOINTED OVER COLUMNS
PLANK FLOOR SPAN
GIRDER SPACING

Section XX

Tests prove plank subfloors are more economical than joists

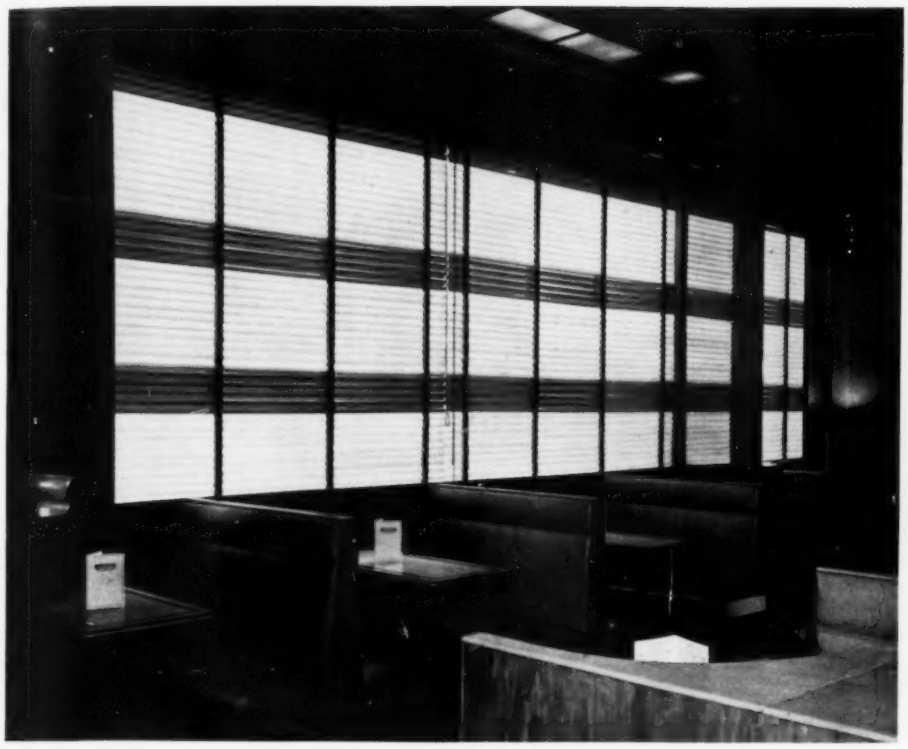
A CONSTRUCTION employing a plank subfloor over beams spaced wider apart than they are usually spaced for joists was recently investigated by technicians of the National Lumber Manufacturers Association. Exact comparisons of this system with the more usual joist construction have seldom been made; now a comparison of buildings erected by the same contractor on adjoining sites gives these results:

PER SQ. FT. OF FLOOR CONSTRUCTION

	Saving by Use of Plank Floor
Labor time	26.3%*
Lumber required	14.7%
Lumber cost	24.8%
Total cost	22.6%
	Increase in Resistance to Heat Loss
Heat loss rate	24.8%

*Labor-time saved per M.B.F. of lumber, 13.6%.

The plank floor was of 2 x 6 D&M plank placed flatwise over girders spaced 6 ft. on centers (5 ft. 6 in. clear span). Planks were 12 ft. long with end joints of adjoining plank occurring over alternate beams. With maximum deflection fixed at L/360, the 2-in. plank floor, of lumber qualifying for a modulus of elasticity of 1,400,000 lbs. per sq. in., will take a load of 52 lbs. per sq. ft.; for an E value of 1,600,000 lbs., it will take a load of 59 lbs. per sq. ft.; the former is 5 lbs. and the latter 12 lbs. more than is required for dwelling design. In fact, it is claimed that, mainly because of the greater continuity of this construction, a material with an E value of 1,200,000 lbs., which rates a load of 44 lbs. on a simple span of 5 ft. 6 in., would probably be stiff enough.



Modern Plastics Competition

Translucent Bakelite Venetian blinds now made available

VENETIAN BLINDS of translucent Bakelite laminated slats are manufactured by Rex Company, Inc. Slats are of S-curve construction to prevent sagging and to afford compact nesting when the blind is lifted. The S-curve is said to permit better ventilation than flat slats. The blinds are available in eight colors—white, cream, amber, scarlet, dark red, dark blue, turquoise blue, and green; interiors can be tinted by diffused light with any one of these colors. The laminated material admits from 10 to 40% of the light, depending upon the color used. The slats clean easily and are not damaged by water, alcohol, or household cleaning fluids. These blinds, made of a special phenolic laminating compound, are insulation against summer heat and winter cold.

Office filing equipment based on "wheel principle" announced

OFFICE FILING equipment based on the "wheel principle" has just been announced by the Diebold Safe & Lock Company of Canton, Ohio. Two types of filing wheels are manufactured—one revolving in a vertical plane and another revolving in a horizontal plane. Among the advantages claimed for this equipment are:

1. Greater flexibility of design is permitted: portable cabinets make it easier to move records to any desirable location, from office to office or, by elevator, from floor to floor.

2. Greater capacity per square foot of floor space.

3. Eye strain is reduced: records can be read and posted from normal positions under identical lighting.

4. Posting and filing are speeded: finding, removal, and replacement of records are easy one-hand operations, from normal working positions.

Light trap captures nocturnal moths and other night pests

A LIGHT TRAP designed for catching nocturnal moths and other night-flying insects is manufactured by The Miller Company, Meriden, Connecticut. The trap is a globe made of Genco diffusing glass, its sides pierced with three funneled slots leading to the light bulb. The light attracts the insects into the globe where the heated air kills them; on a warm night the "catch" may range from 1,000 to 1,500 insects. First developed for porch and kitchen use, and to rid truck gardens of pests, these traps are also used in hotels, summer resorts, and roadside stands.

The trap uses a 100-watt or 150-watt lamp. It is made with and without removable bottoms for dumping accumulations of dried insects.

Reservoir for wet concrete saves on truck mixers

A NEW STEEL hopper for receiving truck-mixed concrete and dispensing it into barrows and carts as needed is manufactured by the Ransome Concrete Machinery Company, Dunellen, New Jersey. The use of this hopper allows the truck mixer to be dismissed without delay. A bottom discharge, equipped with lever-operated double-clamshell gates, controls the flow of concrete into wheelbarrows and carts; it is claimed that better control of the discharge is possible, preventing segregation of aggregate and assuring a more uniform mixture. The hopper may be towed to the job behind any truck; it rides on a special pneumatic-tired trailer undercarriage, which, on arrival at the job, can be quickly detached from the hopper. The total height of the hopper and its frame is 10 ft.; the width, when it is in carrying position, is less than 8 ft. Two lines of barrows or carts may be operated simultaneously from the hopper.

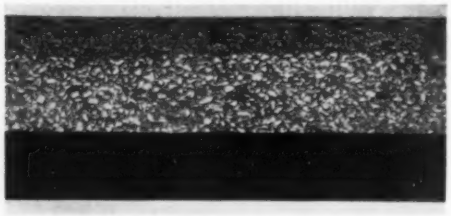
New material obtained from waste liquor out of steel mill vats

A NEW MATERIAL obtained from waste liquor out of the "pickling vats" of steel mills has been announced by the Allied Development Corporation, 1700 Standard Building, Cleveland, Ohio.

The material, which is called "Ferron", is said to have remarkable insulating properties: it is stated that 1 in. of the material affords the same insulation as 15 in. of brickwork. Ferron is further reported to be fireproof, termite-proof, and nonwarpable. It is about one-third the weight of brick and can be cut, sawed, and machined. It is extremely porous: under the microscope Ferron reveals a great number of air spaces; these give to the material its high insulating value. (A brick made of Ferron will bubble for several minutes when dropped into water, and the air spaces can be calculated from the difference in weight of the wet brick and the dry brick.)

Lightweight building block can be made by mixing the material with cement, sand, lime, and other building materials. Ferron is also made in the form of a powder, which can be mixed with water and sprayed on boiler settings, between house walls, under eaves, and in other places where fireproof insulating material is required.

Plastic, nonslip, water-resistant flooring material announced



A PLASTIC, nonslip, water-resistant flooring material called "Monocork" has been announced by the Armstrong Cork Products Company of Lancaster, Pennsylvania. Monocork is composed of rubber latex, a dehydrating powder, granulated cork, and various types of fillers. Latex sets by the loss of water, while the dehydrating agent sets by the absorption of water; when these two materials are in one mixture, the setting action of each ingredient is complementary to the other.

Monocork is applied in plastic form, giving a monolithic surface. For special applications the percentage of cork granules is increased, making the floor lighter in weight and relatively nonslippery either wet or dry. According to the manufacturer, the rubber content of the composition is high enough to make the product flexible, so that it can withstand considerable distortion before cracking or breaking. It is claimed that the combination of cork and rubber results in a surface which is resilient and quiet underfoot and resistant to wear and moisture. Monocork adheres to clean steel, concrete, masonry, composition boards, or wood surfaces.

Ingredients of the material are generally shipped to a job in three containers: one for the rubber latex and all other liquid ingredients; the second contains dehydrating agents and mineral fillers; the cork filler is shipped in a third container. When combined in a mechanical mixer on the job, these materials result in a plastic mixture which is trowelled over the sub-base.

Precision control results in "practically a new material"

PRECISION control of concrete manufacture, said to result in "practically a new material", is now made available by Scientific Concrete Service Corporation, Washington, D. C., under patent licenses from the Toledo Scale Company. This control is effected by specially-designed, precision weighing instruments which assure the specified proportions of ingredients in the concrete mixture. In addition, "The Toledo Method" includes: moisture determination, moisture compensation, a complete graphic record, specific gravity and absorption determination, sieve analysis, and the analysis of fresh concrete. The resulting material is said to be homogeneous within relatively close limits: strength, durability, resistance to wear, volume change, and workability are controlled with a precision comparable to that maintained in the manufacture of steel.

Variations in properties of supposedly identical specimens of concrete, fabricated with the usual proportioning methods, are reported as high as 100%: this lack of precision has heretofore necessitated a correspondingly high factor of safety. Scientific Concrete Service Corporation claims that precision control of concrete manufacture reduces cement costs 10 to 25%, and insures concrete which is relatively uniform and less liable to crack.

According to its sponsors, this engineering service is available to the concrete manufacturer without cost; Scientific Concrete Service Corporation receives as compensation a percentage of the value of the cement saved by use of the service.

New material combines Micarta and natural woods

DURAWOOD, a new material combining Micarta and natural woods, is manufactured by the Westinghouse Electric & Manufacturing Company. The product is not an imitation: the natural wood itself is impregnated and treated so that, according to the manufacturer, its glass-like surface is impervious to liquids, yet will not chip, break or crack. It does not require resurfacing.

Durawood is furnished in sheets 48 x 96 in. It can be cut with a carpenter's saw or drilled for attaching.

DESIGN TRENDS

Courtesy Lincoln Elec. Co.

WELDING—NEW AID TO BUILDING . . .

ARCHITECTURAL
RECORD
COMBINED WITH
AMERICAN ARCHITECT AND ARCHITECTURE

WELDING—NEW AID TO BUILDING

By DOUGLAS HASKELL

Few subjects have been as dramatically spotlighted as was that of welding by the recent $200,000 Contest of the Lincoln Arc Welding Foundation. For the 328 prize-winning papers covered in great detail the application of welding to almost every field of production—with considerable emphasis on building. Always intent on pointing out new potentialities in building design, ARCHITECTURAL RECORD asked Douglas Haskell to analyze some of the most significant papers in this category: herewith is Mr. Haskell's survey.

No. 1: English Engineers Use Welding to Achieve New System for Long Spans

WELDED STRUCTURES should of course not be designed on riveted precedents at all, but redesigned not only as to individual joints and sections, but as to the entire structure, in accordance with the new nature of the welded connection. What is the chief peculiarity of a weld? It is the so-called "monolithic" or continuous, cooperative action among the various parts, once they have been made into one continuous whole. Such systems are "hyperstatic" or "fully indeterminate". It was by taking full advantage of this new resource available through welding that Engineers Anant H. Pandya and R. J. Fowler of London designed the "Dia-Grid" system of floors and roofs that won the Grand Prize in the structural division of the Contest.

In appearance the basic grids are simple, consisting of a grid-work of equally spaced beams set diagonally within an enclosing rectangular frame. Photographs of buildings in which they have have been used instantly reveal their advantage. Here we see vast roof spans, economically framed in steel, which not only leave the floor entirely free but consume no space whatever below the roof-plane itself. Again, there are shown floors or flat roofs widely cantilevered beyond slender supporting columns with an ease comparable to concrete.

The analogy with concrete is important. The crossed beams resemble two-way concrete slab reinforcement vastly enlarged (see Fig. 1), and the radiating pattern above the internal columns is like the reinforcement of drop-slab and mushroom construction in concrete (see the front column in the same illustration). It is in comparison with concrete that the authors feel that they have achieved revolutionary results: "All-welded steel diagonal grids," they say, "have proved to have all the advantages of two-way slab construction, with none of its disadvantages. The common practise in the design of the latter is to follow certain empirical regulations which place many limitations on the layout of panels in plan. The grids under consideration are entirely free from these restrictive rules, and are more adaptable to practical requirements. They exploit the two-way reinforcement and drop-panels ideas in the most economical manner, and all moments and shear forces are analyzed with great accuracy."

As the illustrations reveal, the diagonal beams are always of unequal length and would therefore be of varying rigidity if acting alone. The strength of the grid derives from the equalizing forces due to the continuous elastic nature of the welded structure, which brings about coopera-

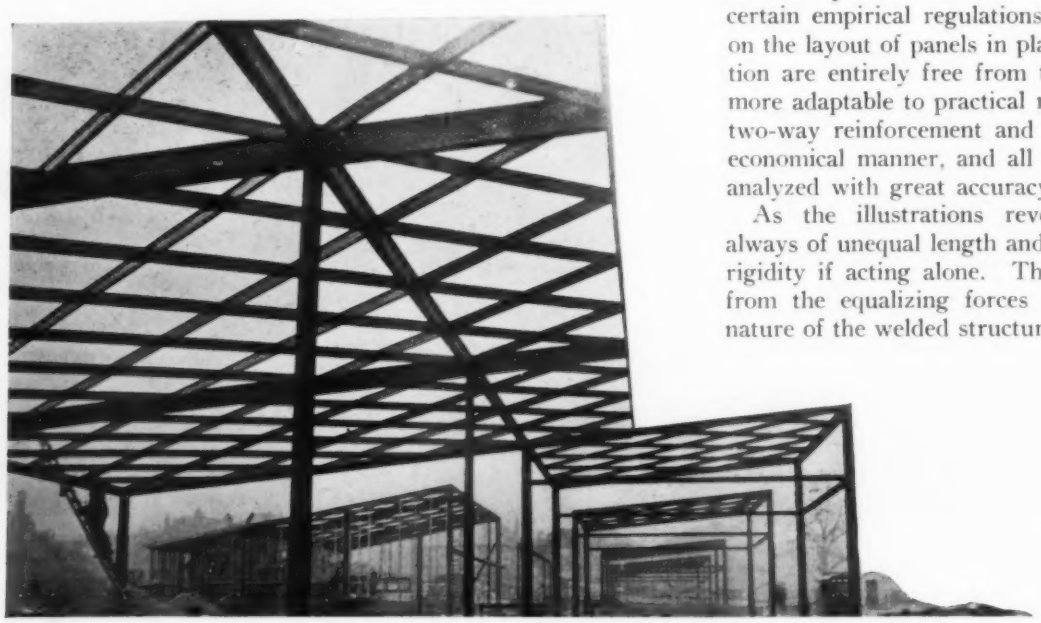


Fig. 1. Structures framed with the "Dia-Grid" system

tion between the members. Of importance is the fact that "all the grid beams are subjected to moments and forces which tend to attain a *uniform maximum value*." Hence, "for any given layout the actual spans and loading can be varied without the necessity of a new calculation. This leads directly to the possibility of achieving *standardized calculations* which are independent of the variables, load and span, and which once made can be applied to a variety of conditions. Furthermore, the selection of the size of the grid beams can be made in a few minutes from the maximum factor for a given layout."

In laying out the plane grid, the sides of the rectangular bay can be divided into 2, 3, 4, 5 or even 6 equal parts. Square bays, however, are best divided into 3 equal parts, this number being most economical in operation. "The aim is always to provide a short corner beam and an angle of intersection as near to 90° as possible."

For the larger spans, beyond 50 ft., it is possible to fold a plane grid into the shape of a gabled roof, with a ridge along the center line and horizontal ties at the gable ends. "The grid, instead of being made up of interlacing straight beams, now consists of a number of cranked beams which are fully continuous at the cranking points and are capable of transmitting moments from one side of the crank to the other." The cranking introduces virtual elastic supports for grid members at the ridge nodes.

With such folded or gabled grids it is possible to span distances up to 300 ft. in the shorter direction—parallel to ridge and valley lines—and *almost unlimited distances* in the other direction (Fig. 2).

Erection of the grids, like their design, had to be freed from riveted precedents before real efficiency could be obtained. Making use of the stiffness of the grid, the engineers devised ways of welding whole bays on the ground and then lifting them intact into place, thus saving greatly on field welding. Lifting in one piece is done even with the gabled grids, this being easier than propping one slope after another.

Summarizing the advantages, the engineers pointed out: 1.) the complete absence of bracings, tie-rods, trusses or other similar members below the roof-plane, making usable space available to the very top of the room. 2.) The enlarged size of individual members compared to truss members, reducing the area for painting up to 40%. 3.) The spanning of large areas with entirely standard rolled sections. 4.) The intrinsic wind resistance. 5.) The new note for 1938: Such a structure would localize the damage of an air attack.

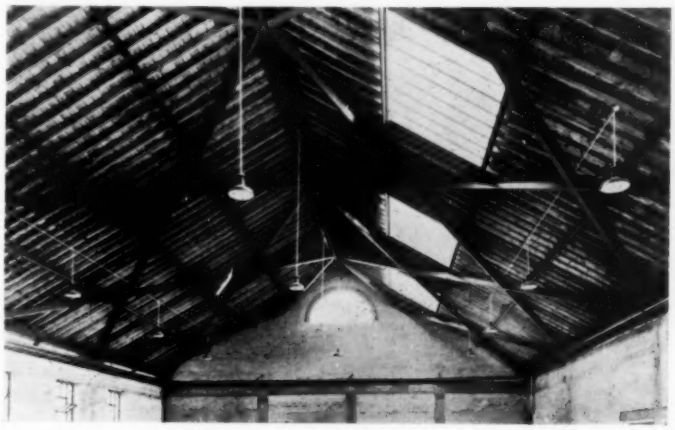


Fig. 2. Folded, the effective span of the "Dia-Grid" system can be enormously extended.

No. 2: Accessory Welding in Riveted Trusses Gives Greater Precision, 35.2% Economy

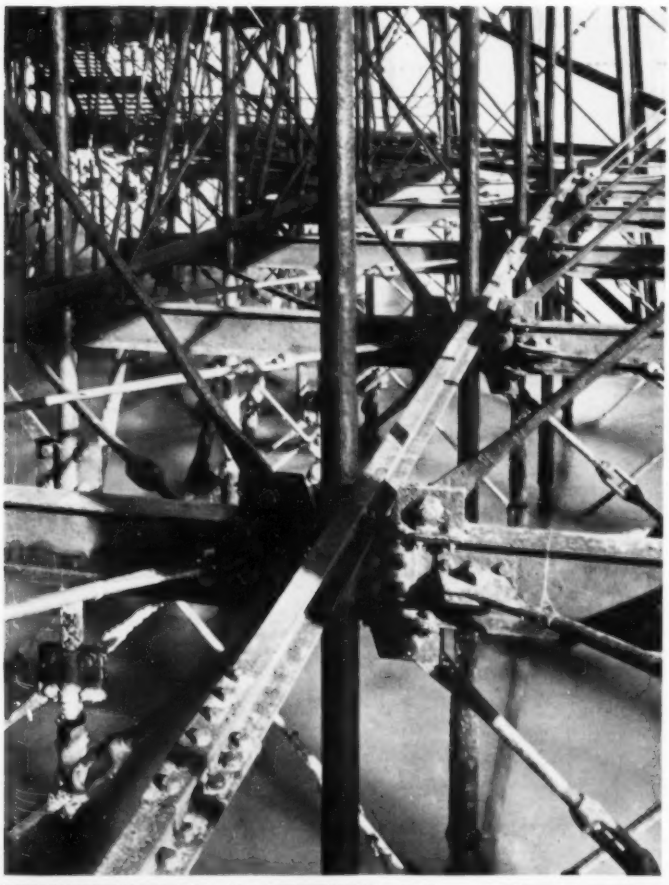
Engineer Wm. J. Duthie was in charge of fabrication methods for the erector of the hangar for the U. S. Naval Station at Sunnyvale, California. With an unobstructed floor area of 300,000 sq. ft., this hangar when built covered the largest free interior space in the world. The contract had been let on a riveted design, and a riveted design it remained, but with great fabrication savings through the accessory use of arc welding.

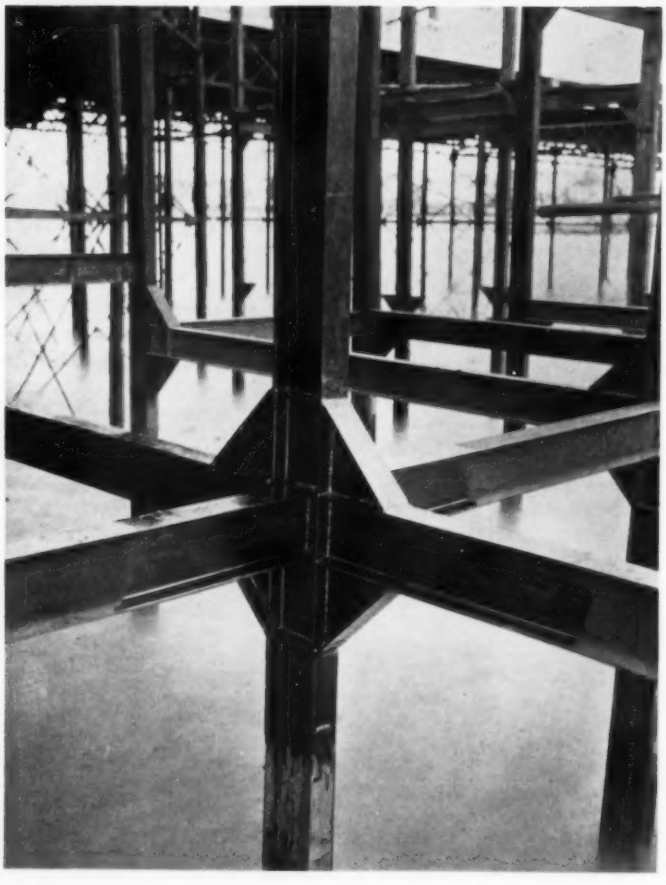
The engineer's attention was chiefly focussed on 28 large similar half-trusses, offering a chance for rapid assembly if only the parts could be made interchangeable. Ordinary riveting procedure does not permit this. Parts are first milled to accurate shape, then punched for rivets, then preassembled, checked, and if necessary corrected. Between steps there intervenes the great enemy of riveting accuracy, which is *creepage*. Because of the inaccuracies it introduces, each truss must undergo preliminary assembly and checking in the shop and be match-marked before shipment to the site.

Mr. Duthie decided that he could eliminate creepage, by simply reversing the steps in fabrication. He would assemble first, not last—by means of arc welding. Having assembled and welded the individual truss chords, he would next mill them accurately to template. Not until the chords, laid in position, made an accurate butt joint at each connection, were any holes laid out for riveting. Since the brackets were already tackwelded in place, a single hole, drilled through the complete member, served for every rivet.

The results were splendid. Only one truss was completely assembled in the shop. It fit so perfectly that all other trusses were shipped to the site without preliminary assembly and match-marking. "As the different members were unloaded on the job site, it was only necessary to keep members of the same mark and location together. Then as each truss was erected, the top member of each pile was taken and placed in position. This eliminated the sorting and turning over of the material to get the proper member for a given truss." The saving in the shop, according to Mr. Duthie, was 35.2% on this part of the job. He did not estimate the added savings in the field, which, because of lessened handling, were correspondingly large.

No. 3: Welding Yields Defense Against Sea, Simpler Framing, Lower Maintenance





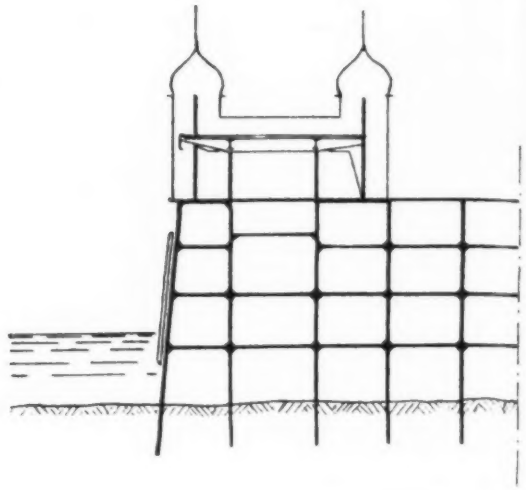


Fig. 3. Framing diagram of reconstructed pier: general design was essentially unchanged.

FEW STRUCTURES are subject to attack so severe as the attack on a pier by the sea. So, looking for a method of sealing up every crack and fissure, Engineer C. Helsby of London, charged with enlarging and extending a steel pier (Fig. 3), turned naturally to welding.

The greatest problem, in the original, riveted pier, had been to keep out the water. In a structure shaken by storms and bumped by steamers, not even a tight bolt or rivet joint is wholly immune to the entry of water, which, once entered, rapidly spreads by capillarity. "Every year bolts and rivets have to be replaced because they burst off under the pressure exerted by rust within the joint, where, after assembly, paint cannot be reintroduced."

Moreover a second characteristic of the riveted structure offers the water a direct invitation. The riveted joint with its superposed plates does not easily transfer bending stresses, therefore diagonal tie-rods are needed to transmit the tensional components of induced stresses. Unless these tie-rods are kept taut, they fail to function; but the manifold impacts upon the pier inevitably cause shackle eyes and pins to wear oval, slackening the tie. Meanwhile rust attacks the turnbuckles as well, making adjustment always difficult, sometimes impossible. Ties must frequently be replaced.

A storm aggravates the situation, much damage being caused by the loosened parts acting as battering rams against the remainder.

The photographs (Fig. 4) show clearly how the engineer was able by welding to clean up the job, once he had persuaded the owners to accept arc welding.

The first effect was to present to the water a *continuous, hermetically sealed surface*. The second was to eliminate 64% of the steel work, representing the tie-rods and their fittings. Since the cost of such items equals 240% of the cost of ordinary rolled sections, it becomes understandable that there was a 31% saving on the cost of the structure as a whole.

Fig. 4. Before and after views of substructure, showing how use of welding eliminated maze of tie-rods and fittings.

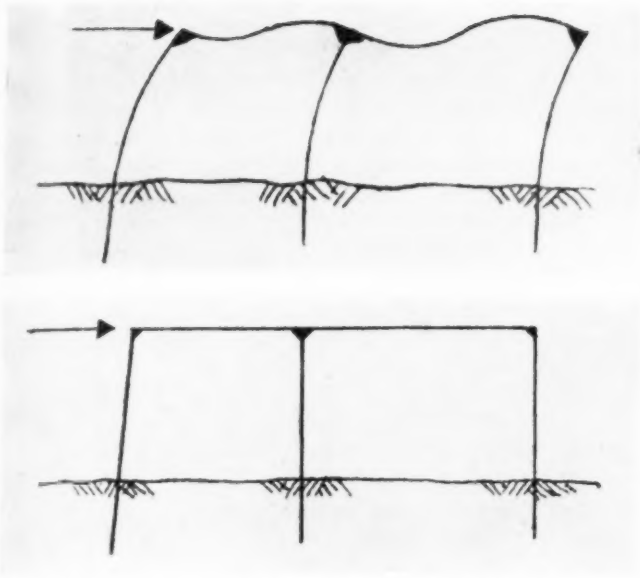
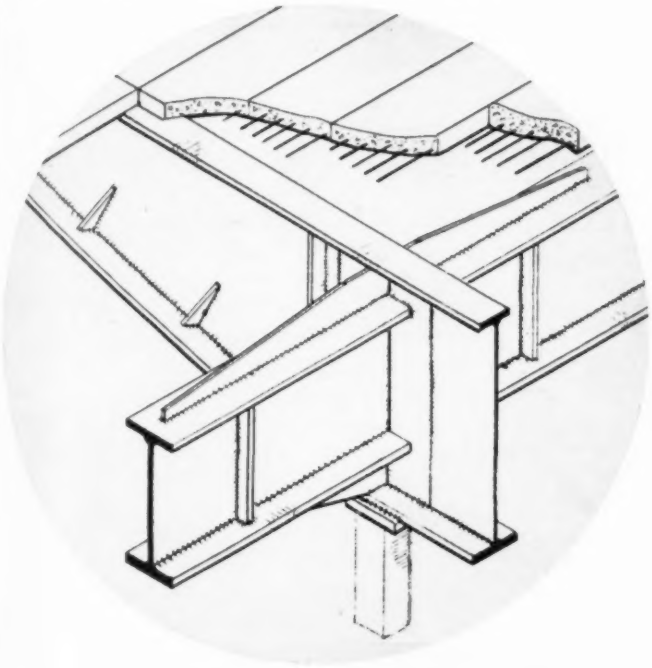


Fig. 5. Impact on welded and non-welded frames.



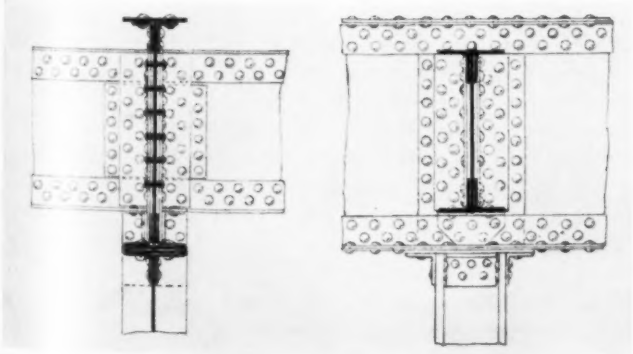


Fig. 6. Compare design as executed with welding (top) with same design problem done with riveting (bottom).

These structural economies, however, are not the end of the story, since the new, simple, and continuous surface will be so much easier to paint and to maintain that the owners will earn substantial savings throughout the entire life of the structure.

The elimination of the tie-rods was possible because of the intrinsic elasticity of the welded connection. "Portal type construction of perfect elasticity can be used, allowing impacts to be absorbed with a smoothly increasing passive resistance, due to the perfect joining medium, arc welding, which gives continuity of stress wthout slip or uncontrollable contraction" (Fig. 5).

Although the simple, elastic, continuous character of the frame was the chief advantage to be derived from the welding process, the engineer gathered up many incidental advantages along the way. There was for example the ease of building up complicated frame members, where riveting would have demanded a multiplicity of plates and often the modification of the design itself because of inaccessibility for rivets. Since the front piers were raking ones, irregular angles were frequent here, as also in the wind-bracing of the superstructure.

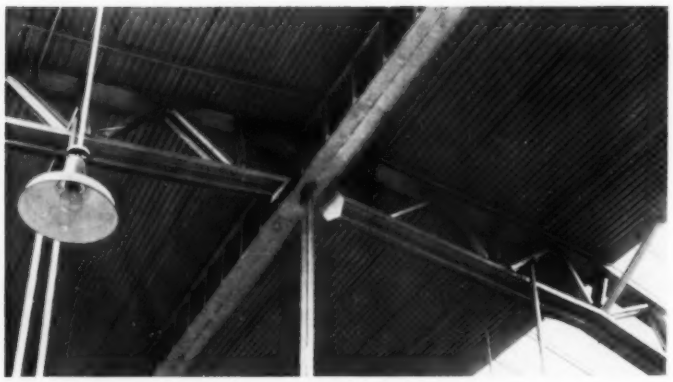
In the connection illustrated (Fig. 6) part of the wind-braced superstructure, not only was the assembly simpler, but it was possible to treat the crossing beam as continuous —a design prohibitive with riveting.

Between the front piers and the next row back there were horizontal diagonal ties, in which it was desired to obtain an initial stress of 2 tons per sq. in. This being the equivalent of 0.034 in. of elongation, the bars, after one end had been welded to its gusset, were warmed by means of a blow-pipe and the free end welded to its plate at the moment when a simple lever and easy reading scale showed that it had reached the correct extension. In this quick way the diagonals were correctly tensioned and fixed. No such simple procedure could have been used to line up the plates for riveting.

To prevent shock to promenaders if a steamer should hit the pier when out of control, and to prevent breakage of glass in the superstructure, it was desired to let the promenade deck slide freely on its supports at right angles to the front of the pier. This was achieved by simple slotted, bolted connections which, translated into riveting methods, would have required no less than 14 rivets apiece. A similar simplicity attended the affixing of a housing for the timber fenders to the front piers; also, the absence of complicated plates and shackles permitted the floor to be fitted around the upright members simply, neatly, and cheaply. Simple box columns, built by toe-welding two L's into a square, were reported by other contestants as well as Mr. Helsby.

As contrasted with the Sunnyvale hangar, reported above, the pier represents a decisive step forward in welding progress. No longer an accessory to field riveting, welding creates a new product, since the indivisible continuity of the frame is a wholly new characteristic. At its best in extreme conditions of abuse, the continuous welded frame is still superior, if properly made, under conditions more nearly average.

No. 4: Use of Welding and Folded Steel Sections Give Novel Structural System



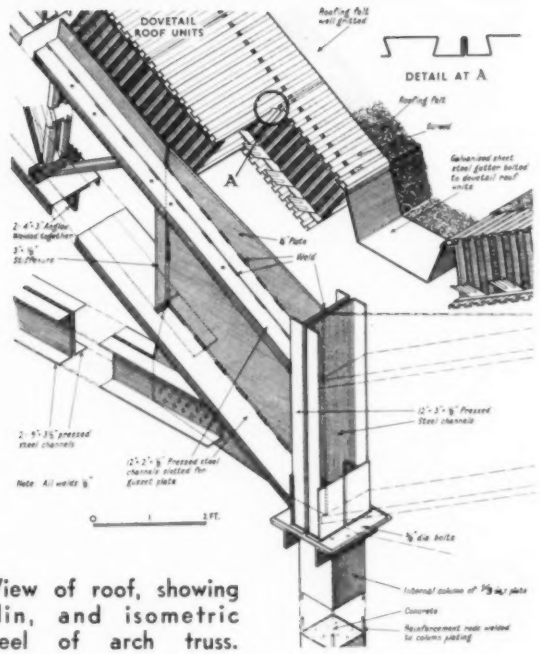


Fig. 7. View of roof, showing top purlin, and isometric detail, heel of arch truss.

THE FACTORY ROOF to be described in the next report was a veritable exhibition piece of *folding*. The roof units were folded and so were the supporting columns and trusses. The roof units were parallel "Lewis" sheets, corrugated into a series of dovetails and spaced 15 in. apart by diagonal braces of the same dovetail section, thus making up into continuous trusses in lengths of 30 ft. and in 2-ft. widths. The wall was of the same dovetail sheets but spaced 6 in. apart instead of 15 in. (Fig. 7). The supporting 3-hinged arches were made up of trusses whose top and bottom chords were a combination of channels and L's, both folded out of mild flat steel and welded together; the diagonals were of 16-gauge sheet again folded into a dovetail section. The columns were also folded.

The author, Engineer R. Sherman of London, declared that he rejected the usual rolled steel sections as being "unwieldy, unsuitable, and uneconomical." He proposed to substitute sections of ⅛-in. thick mild steel plate, folded to shape as required, and then to use arcwelding both to build up the sections and to unite them into the finished structure.

The finish on the roof was 2 in. of concrete screed, one layer of bitumen felt, one layer of bitumen, and a top dressing of pebble. The walls were finished with 1 in. of plaster internally and 2 in. externally.

The isometric view shows that this roof, though firm and highly insulated both for heat and sound, was not light in weight. Its dead weight was 35 lbs. per sq. ft., exclusive of arches, purlins, and other steelwork. "Although this is high compared to the usual roofing materials (e. g., corrugated iron or asbestos), the weight of the steelwork in the roof proved to be about 20% to 40% lighter than would have been required for a roof of asbestos or iron sheet, supported by ordinary rolled steel members."

There was a corresponding reduction in cost. The engineer's calculations yielded him a percentage of saving in favor of the new design of 38.3% as against a similar dovetail roof of normal riveted design, or 38.4% as against even a light-weight corrugated steel or asbestos roof of normal design. Allowing for a turn in steel prices, he still felt that there would be a differential of 20% and 12%, respectively, in favor of welding.

In common with the other reporting engineers, Mr. Sherman found many contributory advantages in welding as he went along. The main one was that, folding his own sheets as required, he was able to use shapes such as flanges to their highest efficiency as compared to roofs made of rolled steel sections for which, "a design having been taken out, it is often only possible to use a section much heavier than required, owing to the limitations of the section rolled."

A neat trick was the construction of internal columns kept down in weight and size by using concrete in a steel box. "The ⅛-in. walls were considered as hoop reinforcement to the concrete, thus increasing the allowable concrete stress. The reinforcing bars (at the corners of the column) were tack-welded to the 8 by 8 in. angles, which were then welded together continuously along their edges."

The author concludes that the method of roofing could well be extended to still larger structures, eliminating tie-bars, by replacing the 3-hinged arches with 2-hinged ones supported on columns designed to take bending stresses. Other types of roof support could also profitably be carried out in thin plate construction, for example N-trusses, Warren girders, French and other pitched trusses.

Advantages of welding folded sections, as claimed by Mr. Sherman, are as follows: (1) "Flexibility" of sections, "by which is meant the ability to use sections which approximate closely to the theoretical minimum." (2.) On tension flanges, there are no reductions for rivet and bolt holes. (3.) On compression chords and flanges, greater width can be given to members without a large increase in weight, making it possible to use stresses nearer to the maximum allowable. (4.) On compression members generally, the metal in the section can be arranged so that the ratio of effective length to least radius of gyration is relatively low, so that decreased working stresses have to be considered less often. (5.) Less metal goes into scrap.

Whereas the engineer of the bridge pier previously described was able by welding to change an old material into a new form, that is, to convert rolled steel sections into a single, continuous, articulated structure, the engineer of the roof herein reported was able by virtue of welding to bring into use a new and cheaper material to begin with, namely, mild plate steel.

No. 5: Lightweight Welded Structural System Achieves New Insulation Values

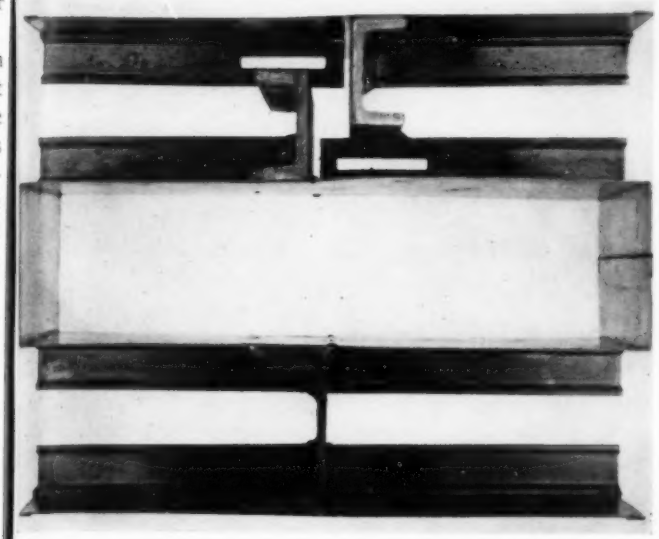


Fig. 8. Comparative cross-sections of McClintock insulated wall system (top) and standard system (bottom).

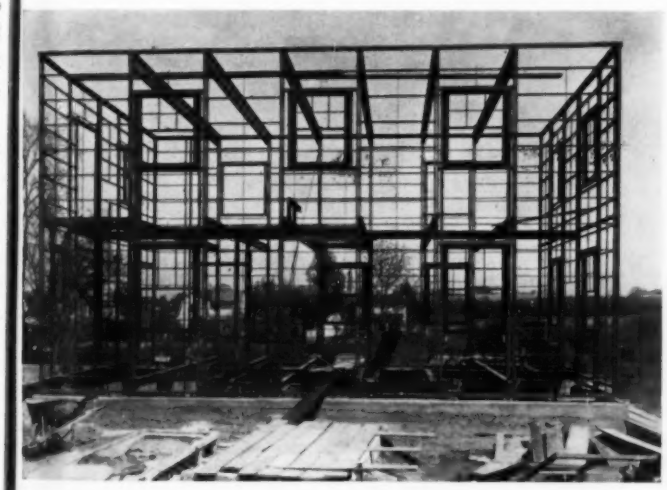


Fig. 9. Completed framing for two-story residence, made up of house-height shop-fabricated wall panels welded on site.

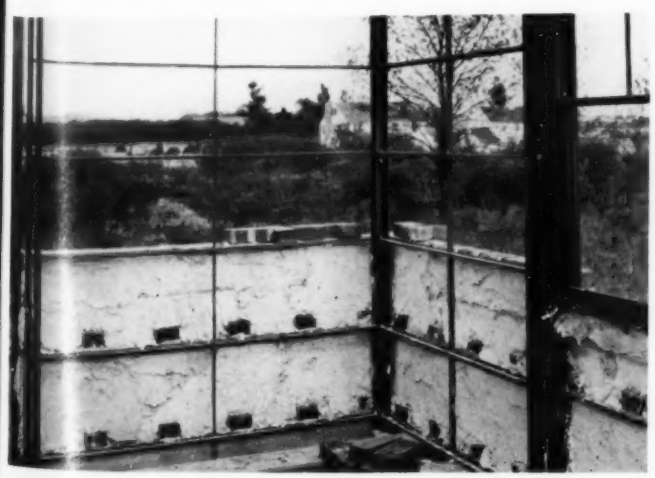


Fig. 10. Cross-girts are spaced for keying in with every sixth course of standard brick-veneer.

INVENTOR E. H. MCCLINTOCK of Springfield, Mass., was not satisfied with existing structural systems; he was intent upon devising a light-weight, rigid, fireproof steel frame with a higher standard of insulation. Taking advantage of the opportunity that welding gives to attach steel members in contact with each other over a minimal area, he devised a light steel panel with "absolutely no through-planes of conductivity."

The panel consists essentially of a double set of horizontal members, one flush to the inside and one to the outside face of the wall, supported by an intermediate set of studs so staggered as not to carry through the whole thickness of the wall. The photograph of a cross-section (Fig. 8) clearly indicates how the through-planes are broken at the connections. The only contacts between the vertical studs and the double horizontal girts are between the crossed flanges; and even where such isolated contacts appear, the horizontal member is *slotted,* retarding conduction by breaking the through-plane.

Tests were made of insulated and uninsulated frames otherwise similar by attaching them (as shown in Fig. 8) to opposite sides of a tank in which was placed dry ice (temperature —38° F.). In one hour condensation appeared at the bottom of the sheet lining on the uninsulated frame, and spread upward in parabolic form, continuing to show throughout the seven hours of the test. No condensation appeared at any time on the sheet attached to the insulated frame.

For residential construction, the panels are 4 ft. wide, full house-height, and only 3 in. in cross-section, weighing 2½ lbs. per sq. ft., so that one panel for the usual 2-story house weighs not over 200 lbs. The studs are staggered pairs of 1.78-lb. two-inch hot-rolled channels, and the double girts, spaced at 15¾ in. vertical intervals, are .75-lb. one by seven-sixteenth-inch channels.

The 15¾-in. spacing of cross-girts—which incidentally provide wind-bracing—is adapted to keying in every sixth course of brick-veneer, if this is to be used as wall-facing (Fig. 10), and every fourth course in the "Ideal" method of using brick on edge; this spacing also adapts itself to wire lath, obviating the use of wood furring.

Such frames are said not to depend on the envelope, either during construction or afterwards, and need no temporary support; on the contrary the steel lends support to such types of covering as "Ideal" brick veneer, which are weak in themselves. Design is as free as design for wooden frames; but the method uses savings inherent in predominantly shop construction.

Computing the cost of a 4-in. brick wall at 37 cents a sq. ft. including furring, and the erected cost of his steel frame at 20 cents a sq. ft., he estimates the saving at over 15 cents per sq. ft. of wall.

Mr. McClintock's design can be covered with brick, stone, plaster or metal; it is not especially fitted for direct application of wood or composition sheets, the strong point of the design to follow.

No. 6: Steel and Wood, Integrated in New System, Give New Flexibility

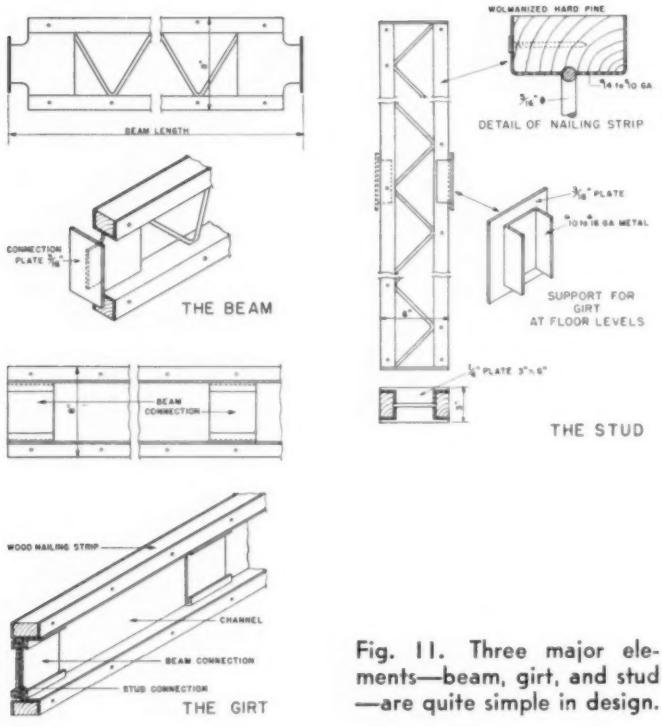


Fig. 11. Three major elements—beam, girt, and stud—are quite simple in design.

COMPARATIVE COSTS

COST OF OLD TYPE WALL, NO FIREPROOFING FEATURES		
Face brick	$ .42	sq. ft.
Backup brick	.58	" "
Waterproof coating	.03	" "
Wooden wall furring	.03	" "
Wire lath and plaster	.13	" "
	$1.19	" "
COST OF NEW TYPE WALL, 3-HOUR RATING, FIREPROOF		
Face brick	$ .42	sq. ft
Waterproofing	.02	" "
Wall ties, special	.03	" "
Insulation, fireproof	.12	" "
Steel	.16	" "
Lath and plaster	.13	" "
Reflective insulation	.03	" "
	$ .91	" "
COST OF OLD TYPE FLOOR CONSTRUCTION, WOOD		
Finish flooring	$ .16	sq. ft
Sub-floor	.06	" "
Wood floor beams	.08	" "
Bridging	.02	" "
Furring	.03	" "
Wire lath and plaster	.13	" "
	$ .48	" "
COST OF NEW TYPE FLOOR, FOUR-HOUR RATING		
Finish flooring	.16	sq. ft.
Sub-floor	.06	" "
Fireproofing	.14	" "
Steel	.15	" "
Wire lath and plaster	.13	" "
	$ .64	" "

Fig. 12. Comparative cost data, part of the McIntosh paper, indicate economies and higher fire-resisting values.

ARCHITECTS have had a standing quarrel with those inventors of new structural or insulating systems who have sought to stretch the good qualities of a single material to cover all the complex needs of a house. The first-prize winner in the Structural Houses classification was guilty of no such error. His contribution lay in a close and economical marriage of steel and wood: steel for fireproofing and support, wolmanized hard pine for the easy attachment of finish.

The outstanding merit of the design described by S. Fraser McIntosh of Insulated Steelbilt Structures, Inc., lies in its utter simplicity. The components are an open stud, a light nonbearing partition stud, an open beam, and a girt, with handy connection plates. The drawings serve as a complete description (Fig. 11). After a trial of various methods, it was decided to employ arc welding; some of the operations could in fact be done only by arc welding.

Although adaptable to usual random methods of design, such a frame is most economically fabricated on a module planning basis. "By using a module system . . . shop detailing is eliminated almost entirely, since most of the required shop information is covered in listing by numbers. For example, 'B-12-8-16' is an order for 12 standard beams 8 in. deep for a 16-ft. room. The order for 2-standard girts 8 in. deep for a 14-ft. room was by this designation: G-2-8-14. SS-40-6-9-9-9 ft. 6 in. is the order for 40 single studs 6 in. standard for a building with a first-story height of 9 ft., second story 9 ft., third story 9 ft. 6 in. Had the order read DS instead of SS it would have called for interior studs with double beam supports."

"No comparison between various steel frames can be made," asserts the author, "without considering what has to be done after the steel is erected to take care of enclosing materials and other things such as installation of door bucks, grounds for plastering, fastening for wood trim, and nailing strips for finish floors. . . . The frame described does not require temporary bracing, connections keeping the frame true and plumb. Also furnished as part of the frame proper are all necessary requirements for fastening windows, doors, flooring, plaster grounds, interior trim, and insulation."

Also appended to this paper is the most complete list of the advantages for the house and apartment builder of the general type of light construction in steel made possible by welding:

(1.) Nonshrinking structural members
(2.) Elimination of plaster cracks
(3.) Ease in fastening materials to the frame
(4.) Simplicity of design
(5.) Elimination of rot and vermin
(6.) Use of standard finishing materials
(7.) Simplification in the installation of heating, plumbing, and electrical equipment
(8.) Rapidity of construction
(9.) Adaptability to any architectural "style"
(10.) Transfer of work from field to shop
(11.) Simplified shop detailing
(12.) Low shop equipment cost

No. 7: Architect Uses Welding to Achieve Fire- and Verminproof House

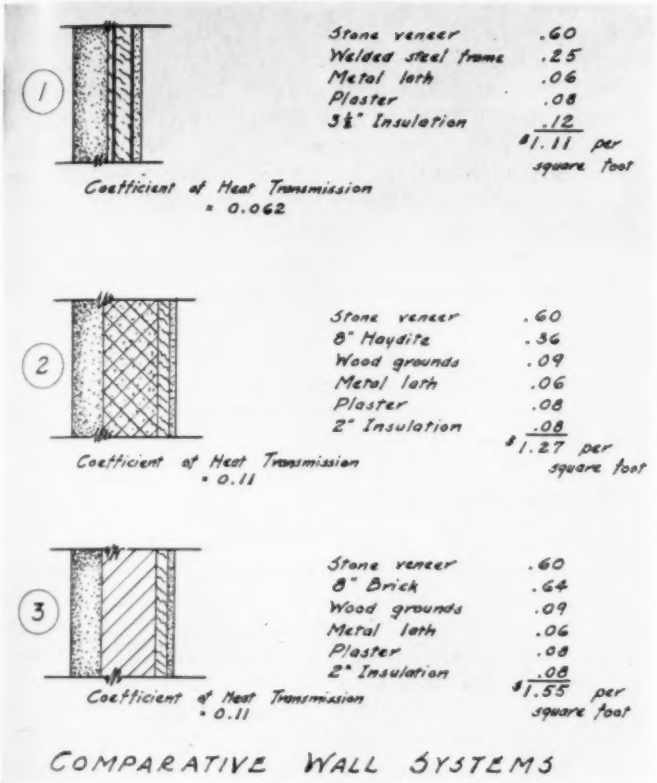


Fig. 13. Comparative data on three types of wall construction

"HEARTHSTONE" is an unusually large country house; each leg of the L has a length of over 100 ft. What chiefly concerned Architect Myron T. Hill was the remoteness of Hearthstone, set in the Ottawa Hills, from efficient fire protection. So he set up three highly fire-resistant types of wall construction, to calculate the relative cost. His results are expressed in the diagram:

Choosing the welded steel frame, the architect made no attempt at module design, steered clear for the sake of easy contracting from any patented type of erection. Essentially his frame was like the wooden "braced-frame" type. It was made up of large shop-welded panels of one-story height, using 3-in. channels as studs, all panels being held down to dimensions less than 10 by 18 ft. for trucks to haul; the largest weighed less than 500 lbs. The 45 tons of structural steel were erected by four structural iron workers and a foreman in ten working days, with the necessarily intermittent help of a field welder throughout the whole period. A plate was laid on the foundation, then first-floor beams and panels; then the whole first story was aligned and welded with the aid of gas-driven welder using coated electrodes and making ¼-in. fillet welds throughout. Field welds were held to a minimum, since their cost was found to be 3½ times the shop welding cost. The architect was pleased with his girt system for supporting second-floor beams, which left the full vertical spaces between studs free for continuous runs of pipe and ducts; he liked the low cost, and rested easy because his fireproof and verminproof structure would never shrink and crack the plaster.

No. 8: Open-web Welded Frame Gives Flexibility in Duct Layouts

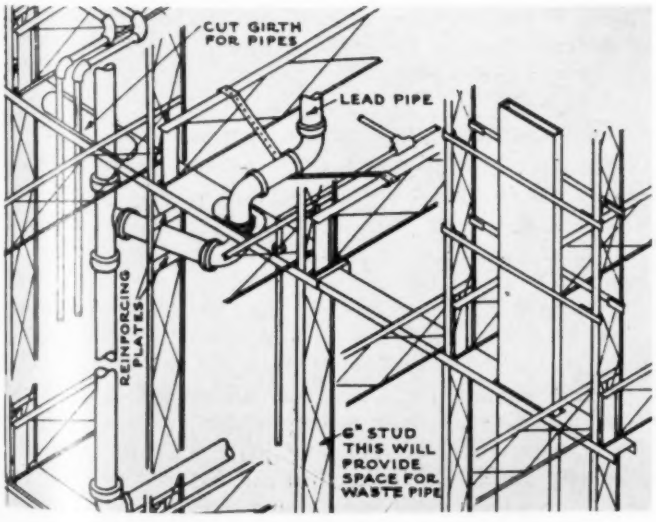


Fig. 14. Open framing permits flexibility in ductwork.

LIKE THE FRAME used by Myron Hill, that used by Architect Waldron Faulkner, for his own house, offered no important structural novelties. The layout was made—of course under the architect's supervision—by Bethlehem Steel, and employed open members for joists as well as studs. The chief added advantage of the light frame, procurable only by welding, was in relation to the air conditioning. It was possible to carry the whole complicated system of space-consuming ducts *through* the floor framing instead of destroying the spaciousness of the basement underneath. This was done by cutting through the bars of the open joists at the appropriate place, and welding in position a stiffening plate with an opening in the center fitted to the duct. Only welding would permit the use of this easy procedure. Plumbing pipes and electric cable also passed right through the frame in any direction, and could therefore be considerably shortened.

9. Summary

Fig. 15. A welded-frame apartment house recently completed in New York—first American city to amend its building code to permit welding.

ONLY TWO or three of the many classifications in the Lincoln Foundation's contest were of direct concern to the building designer: and, in the foregoing, we have already briefed the prize winning papers in these classifications. But taken together, the 328 papers in this competition have a wider—if less direct—significance for building production which cannot be ignored. They indicate rapidly rising standards in the field of industrial production which must inevitably affect building and the building designer. They represent every kind of industry and occupation, from all over the world. More important, *they are documented records of the direct personal experience of designers and fabricators in these varied fields.* The authors are aircraft, automotive, and boat designers; railroad equipment designers and railroad operators; they have designed tools and built them, acted as superintendents of machine production in a dozen industries, were foundrymen, metallurgists, structural engineers, and architects.

Adding the sum of evidence brought in by contestants the jury concluded that the general adoption of the methods proposed might be expected to save industry in general the sum of $1,600,000,000 a year. Were even a part of this prediction to be realized, it would justify the $200,000 outlay, and would also justify study of the conclusions by every professional concerned with production.

Even a cursory examination of the architectural and structural papers in the Lincoln Arc Welding Contest reveals the sweeping progress made since the time when architects first became aware of welding as an expedient against noise. Progress in this country has unfortunately been slower and less even than in Europe—due perhaps to anacronistic building codes, regulations, etc. Many of the prize-winners in the present contest were English, but their application to this country are obvious. In any event, a rough tabulation of the different degrees of use to which welding can be put is possible:

1. Old methods expedited

The Sunnyvale Hangar was an example of welding, the "carpentry of steel" in use simply to tack pieces together to make punching more accurate and the riveting process quicker. The advantage was confined to a considerable reduction in cost.

2. Design refinement

Welded structures generally speaking have come to show a remarkable simplicity and cleanliness of profile, especially in large girders. A part of this refinement is due to the greater *flexibility* of the process: reinforcing strips are easily cut to special shapes as required and attached without difficulty in fairly tight places. A second element in the refinement lies in design *translation*, for example the translation in Sherman's roof from rolled sections into mild plate steel easily folded to precise requirements. The result was not only the employment of a cheaper material but the use of shapes such as flanges to higher efficiency. This brings us straight to the next stage.

3. Diversification of materials

Here we still stand only at the threshold of the possibilities. Arc welding is only one of three forms; resistance welding has already extended the welding field through the difficult field of stainless steel and into non-ferrous metals such as brass and aluminum. An important aspect of diversification is the *coupling of materials*, our example being the use made by MacIntosh in his light house-frame of steel in combination with wood, to make up a combination joist or beam with qualities not available in either material alone. The age of single-material worship is past. Diversity of materials permits wider choice in working to exact, predetermined standards.

4. Securing new qualities in the product

The result of several such welding developments working on one another has been the evolution of new qualities in the finished product. Thus the use of elasticity in the steel recreation pier eliminated shock and breakage by simple means. New qualities are introduced into the structure of the house when it becomes possible, as recounted by two of the contest architects, to pass pipes and air-conditioning ducts almost at liberty *through* the frame.

Full exploitation of new possibilities will occur only when there is free choice among all three types of welding for different parts of the same job. Stainless steel, for example, can as yet be handled satisfactorily only by resistance welding; yet its corrosion-resisting qualities, which have caused wide use in the food-container industry and

the railroad equipment industry, are important to shelter as well. Incidentally, welding *control* and accuracy have made the process an entirely different one than it was ten years ago; stainless steel welding time is held to ½ cycle, or 1/120th second.

5. Radical redesign

Old habits of thought must be completely dropped if a new process is to be used with real efficiency in accordance with its own nature. Quite appropriately, the grand prize in the structural division went to a new type of floor and roof evolved entirely with reference to the properties of welded joints. This was Robertson and Pandya's "dia-grid" roof and floor system.

A few other innovations not mentioned in the contest papers under review are briefly listed:

Rods: Not in the contest, the Church in Culver City, California, reported in the last issue of the Architectural Record (page 60), is an example of a skeleton arc-welded out of ¼-inch to ¾-inch steel rods. It was virtually the erection of a reinforcing frame first, to be sprayed with concrete afterwards.

Pipes: Used in bicycles for over fifty years, but first thought of by many architects as merely decorative adjuncts, or as something inevitable in a heating system, are pipes. They now show themselves suitable as structural material not only for bus-seats and modish chairs but for scaffoldings and finally for buildings. Under appropriate conditions a tubular section has greater strength in relation to its weight than any other section. A striking tubular structure was a water conduit in Switzerland spanning an arch of 140 ft. with no intermediate support. Pipe framing has been used in industrial structures with a saving as high as 3 cents per cu. ft. of finished structure.

Steel tube construction is rapidly being developed in the airplane, automobile, and trailer field. The well-known "Scarab" car engineered by Stout Laboratories provided seating capacity beyond that of luxury cars with a tubular, chassis-less frame weighing approximately 25% less than the average standard of low-cost car construction. A tubular-frame bus, involved in a collision while travelling 60 miles an hour, cracked only its windshield and one windshield side-glass; on examination engineers imputed this to the shock-localizing properties of its frame. Pipe or tube framing is economical only when welded.

6. Erection methods simplified

Prominent in every efficiency endeavor is the effort to design for maximum production in the shop, minimum in the field. This is true even when modern flexibility carries the shop to the field, as welding jigs can be set up at the site. Not the least important innovation reported in the paper on "dia-grid" structures was the possibility of completing the whole structure on the ground under conditions approaching shop-work, and erecting it in a single operation.

The rapidly increasing scope and diversity of welding within the past ten years has brought the necessity of concentrated study. Within the last month Ohio State University has announced a new course leading to a degree in welding engineering; and other universities may be expected rapidly to follow suit.

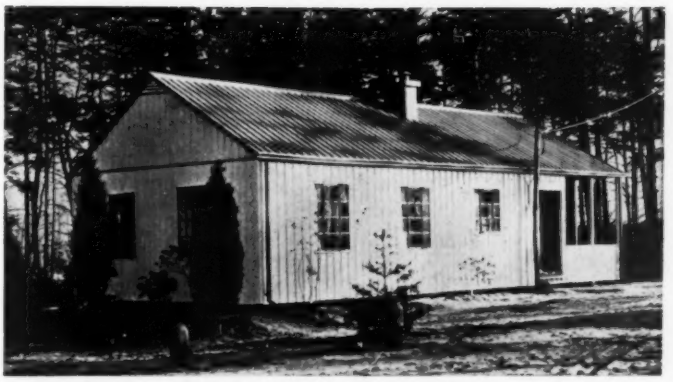
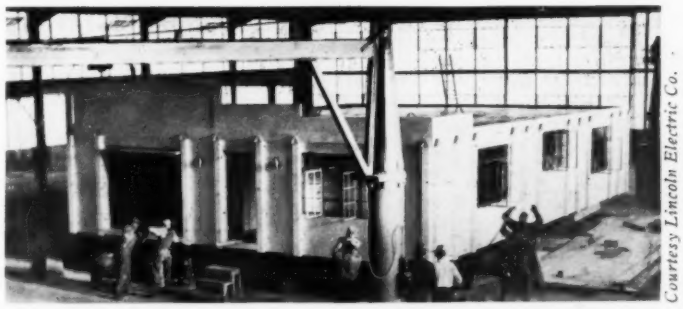
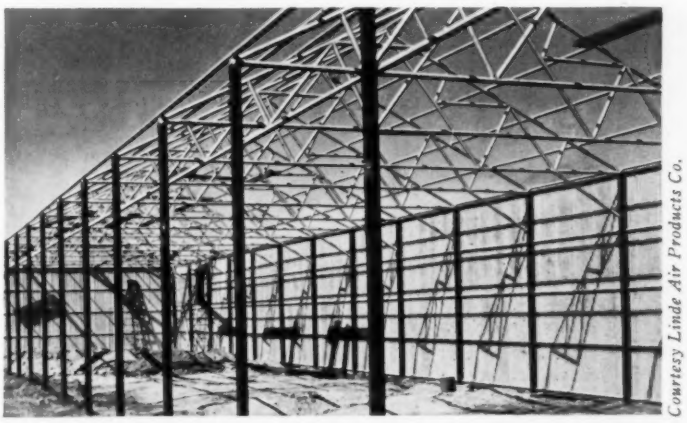


Fig. 16. One of a line of all-steel, shop-welded houses recently introduced in the South by United States Steel.



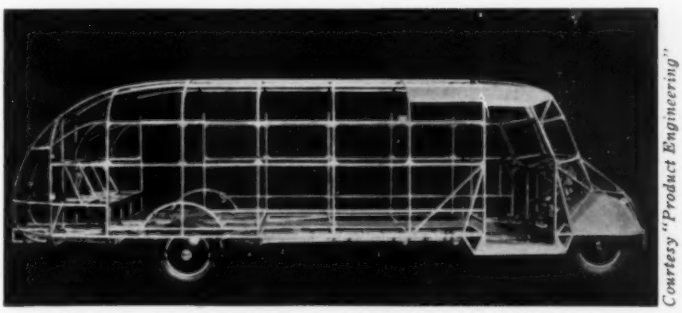
Courtesy Lincoln Electric Co.

Fig. 17. The now-famous Le Tourneau "floating house" was completely shop-fabricated, floated to its site.



Courtesy Linde Air Products Co.

Fig. 18. Welded steel tube construction in a warehouse in Denver, Colorado.



Courtesy "Product Engineering"

Fig. 19. Welded steel tube construction has reached its highest development in the automotive and aeronautics field.

Review of New Books

"Free and rugged masonry and a vigorous log construction . . . "

"A bathhouse of sophisticated appearance in streamlined Colonial . . . "

"Commemorative of some circuitous route between the Congo and the Emerald Isle . . . "

MAN IN THE WILDERNESS

THESE THREE volumes* are a very valuable addition to park and recreation literature. The park and recreation movement has grown enormously in recent years, and here we have an expression of its widespread achievements. As a summary of policy trends, and a directional pointer for many problems of function, the books are very good. But as an index of the American park designer's sense of form, they are very disappointing. Among the cute and the ingenious, the rustic and the picturesque, there are a few structures whose handling of material, relation to site, and general form conception, have true design distinction. But so much preoccupation with "precedent," such rustic inhibitions and inferiority complexes, are exasperating and stifling to one who considers things to come more important than things that have been.

In spite of rustic charm and backwoods handicraft handling of material, in spite of "organic integration"—which seems to mean a very obvious "growth" from natural rock outcrop to finished masonry—one is inclined to wonder whether a frank avowal of 20th century thought and technique might not have produced something equally delightful and equally organic. Only in extreme cases would lack of transportation and technical facilities, or availability of materials, make this completely impossible. Light, refined, carefully finished structures of wood, steel, concrete, set in the wilderness, might emphasize more effectively Man's inevitable return to Nature, than this very labored, rather clumsy, extremely inhibited rusticity. One is led to wonder what the ancient Greeks, with their painstakingly refined and elegant stone temples set among rocky wildernesses, could have produced if affected with this rustic inferiority complex.

In Europe, where precedent is piled high at every turn, designers produce startling innovations; in America, still

(*Continued on page* 81)

***PARK AND RECREATION STRUCTURES. By Albert H. Good, Architectural Consultant, National Park Service. U. S. Government Printing Office, Washington, 1938. Illustrated. Three Volumes. 200, 212, and 192 pages respectively. 8¾ x 11¾ in. Price, 75¢ each.**

WINDOW TREATMENTS

Cottacho

Residence in New York City, Mott B. Schmidt, architect

WINDOWS . . . in the Living Room

Gottscho

1

Gottscho

2

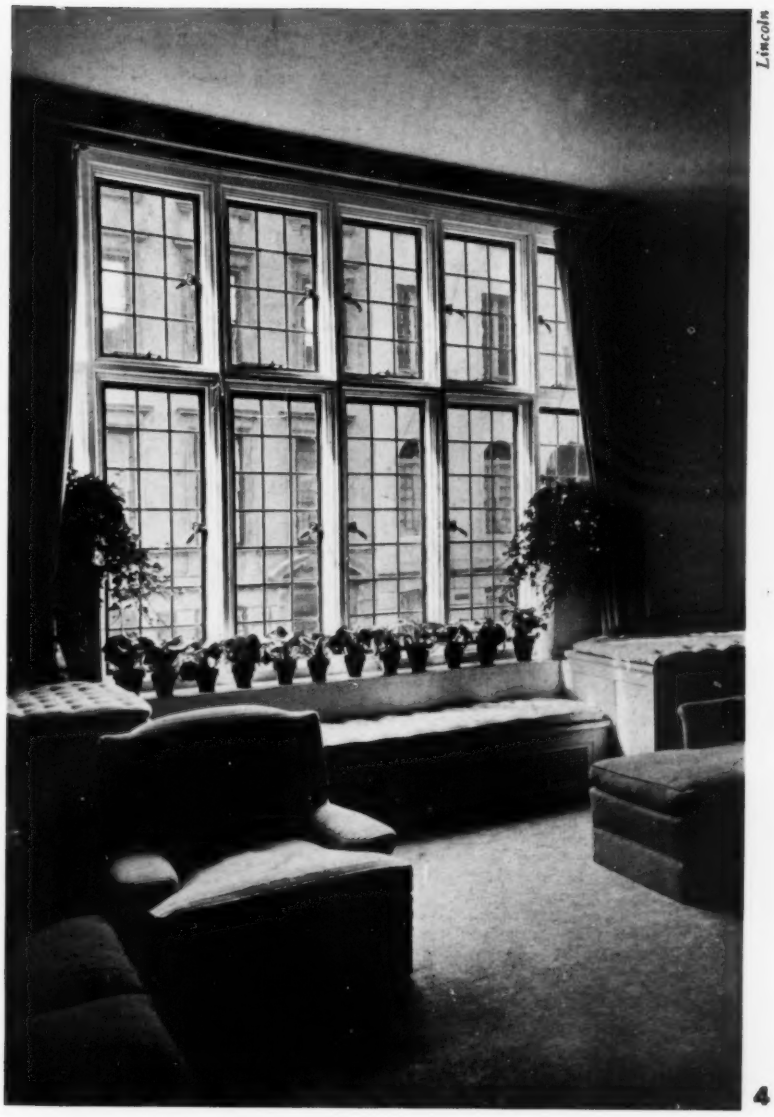
ON THIS PAGE: 1 treats a bay window both as light source and as conservatory: residence in Norwalk, Conn., Robertson Ward, architect. 2 is a rounded bay with window seats in a Palm Beach, Fla., residence, Treanor and Fatio, architects.

ON OPPOSITE PAGE: 3, a tall window with seat in a residence in South Miami, Fla., designed by Howard Knight, architect. 4 is in a New York City apartment, and combines cabinets and built-in seat over radiators with the window treatment; Joseph Mullen, designer. 5 uses glass brick for light and privacy, plate glass casements for ventilation in a residence at Tyler, Tex., Hobart Plunkett, architect.

George D. Fleming

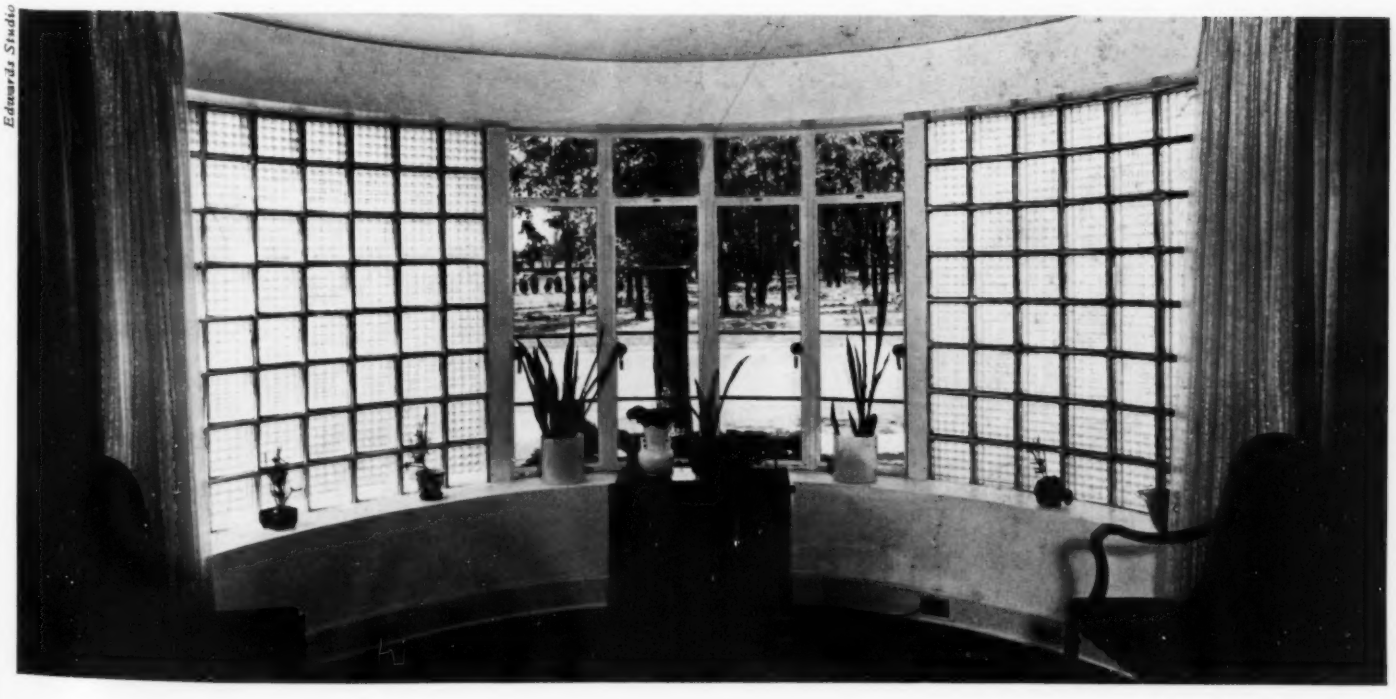
3

Lincoln



4

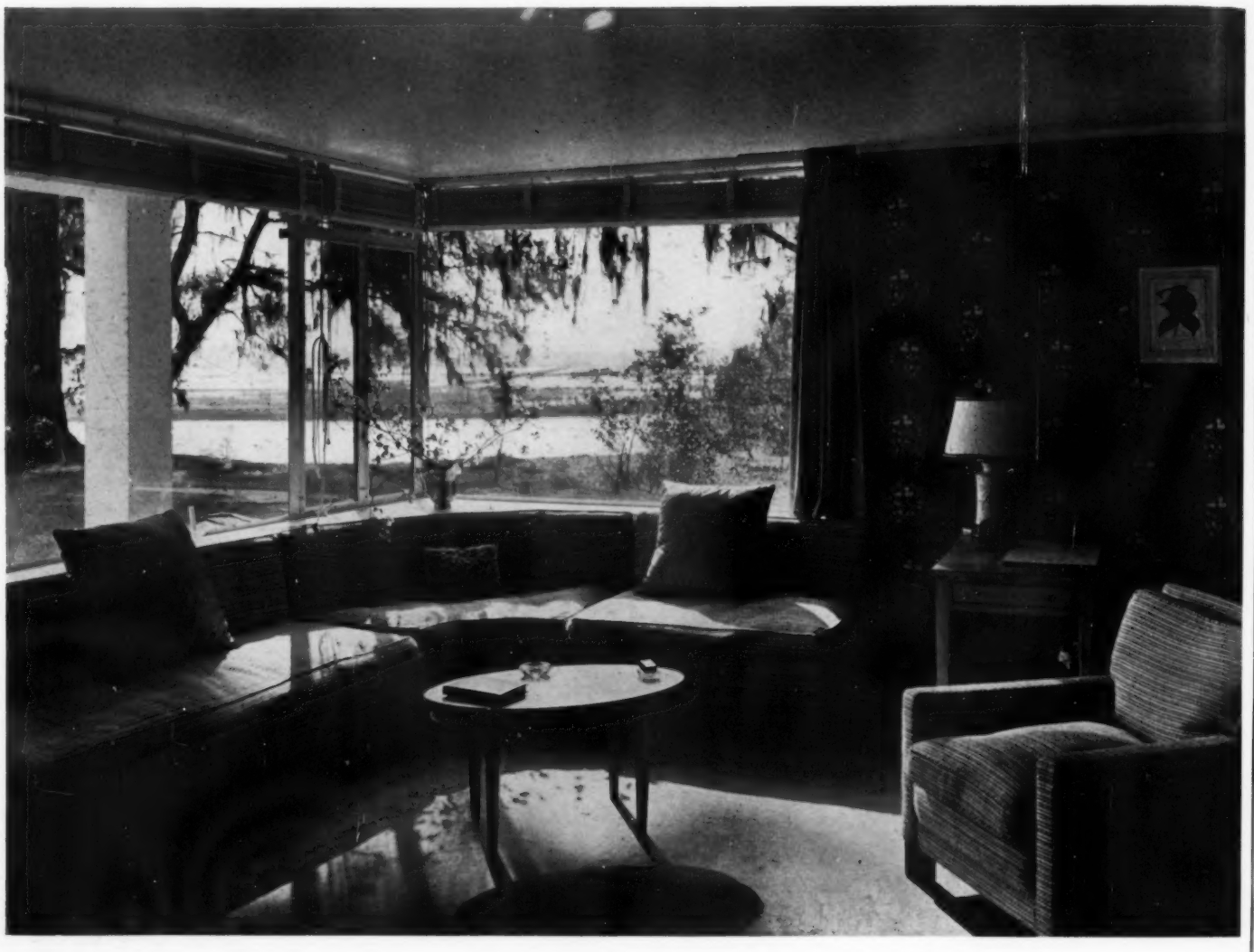
Edwards Studio



5

WINDOWS . . . in the Living Room

Gottscho



6

Dell and Wainwright

7

ON THIS PAGE: 6 shows treatment of living room window in a residence in Moncks Corners, S. C., Edward D. Stone, architect. In 7, sliding windows extend the length of the living-room wall in a house at Kingston, Surrey, England, E. Maxwell Fry, architect.

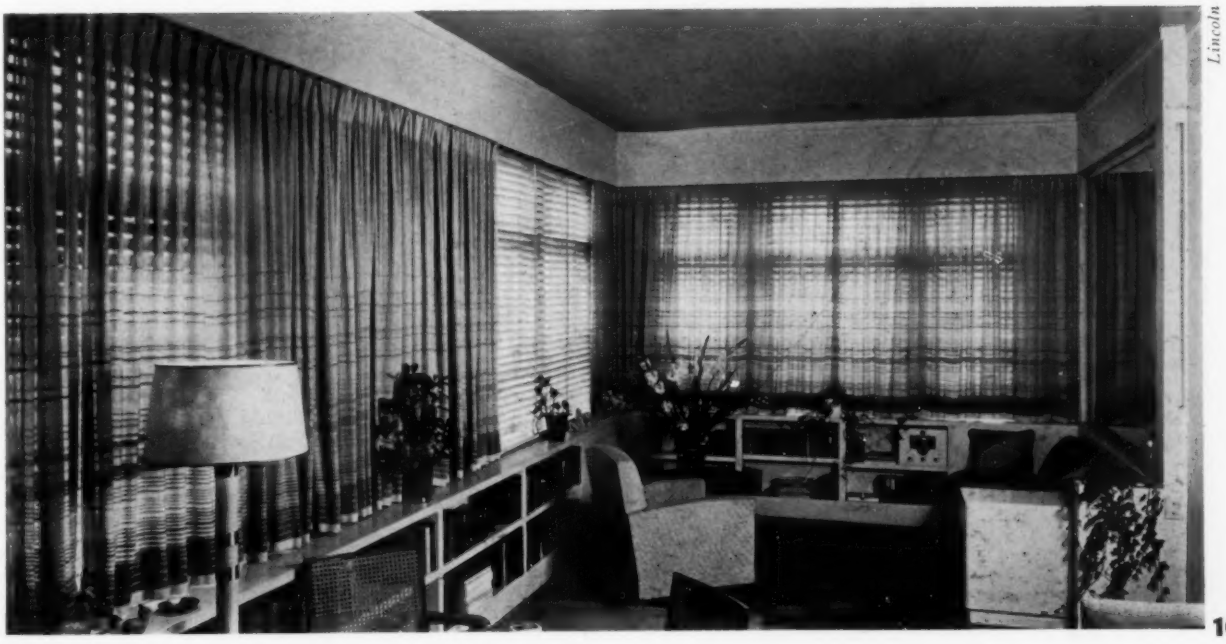
ON OPPOSITE PAGE: 8 features a built-in flower box in a residence at Brookline, Mass., Samuel Glaser, architect. 9, built-in book shelves are combined with the window treatment in a residence at Bakersfield, Cal., Richard J. Neutra, architect, and Peter Pfisterer, associate, and, 10, designed by Joseph Aronson for a residence at St. George, Staten Island, N. Y.

Rollin W. Bailey

8

Julius Shulman

9

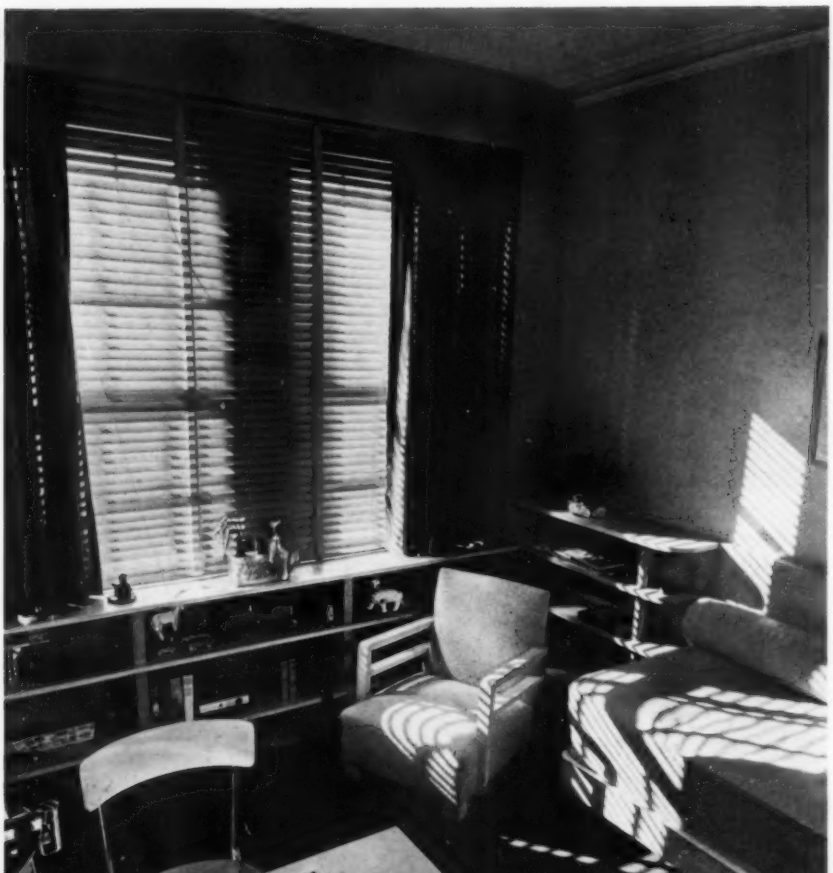


Lincoln

10

WINDOWS . . . with built-in shelving

Lincoln



11

12

Van Ando

13

Gottscho

14

15

Richard Averill Smith

16

. . . and in the Bedroom

Mott Studios

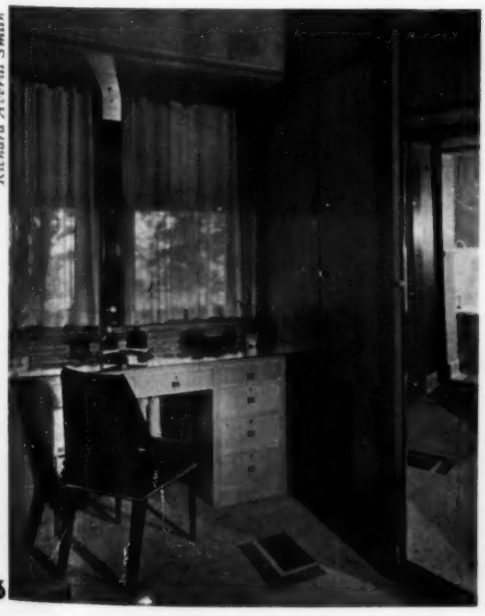
17

ON OPPOSITE PAGE: 11 is in a Brooklyn, N. Y., dwelling, Joseph Aronson, designer. 12 is in a residence at Westwood, Cal., Leo F. Bachman, architect. 13 combines book shelves and desk in a New Milford, Conn., residence for which H. P. Staats was architect. 14 was designed by Richard Henry Davis for a residence in Greenwich, Conn. 15 shows built-in shelving in the dining room of a Detroit, Mich., residence, Earl L. Confer, architect.

ON THIS PAGE: 16 is a dressing room designed by Pierre Dutell. In 17, closets flank the bedroom window in a residence at Palm Springs, Fla., Charles O. Matcham, architect. 18 is the bedroom of a residence in Bakersfield, Cal., Richard J. Neutra, architect, and Peter Pfisterer, associate. 20 was designed by Robert M. Brown for his Philadelphia home.

Julius Shulman

18



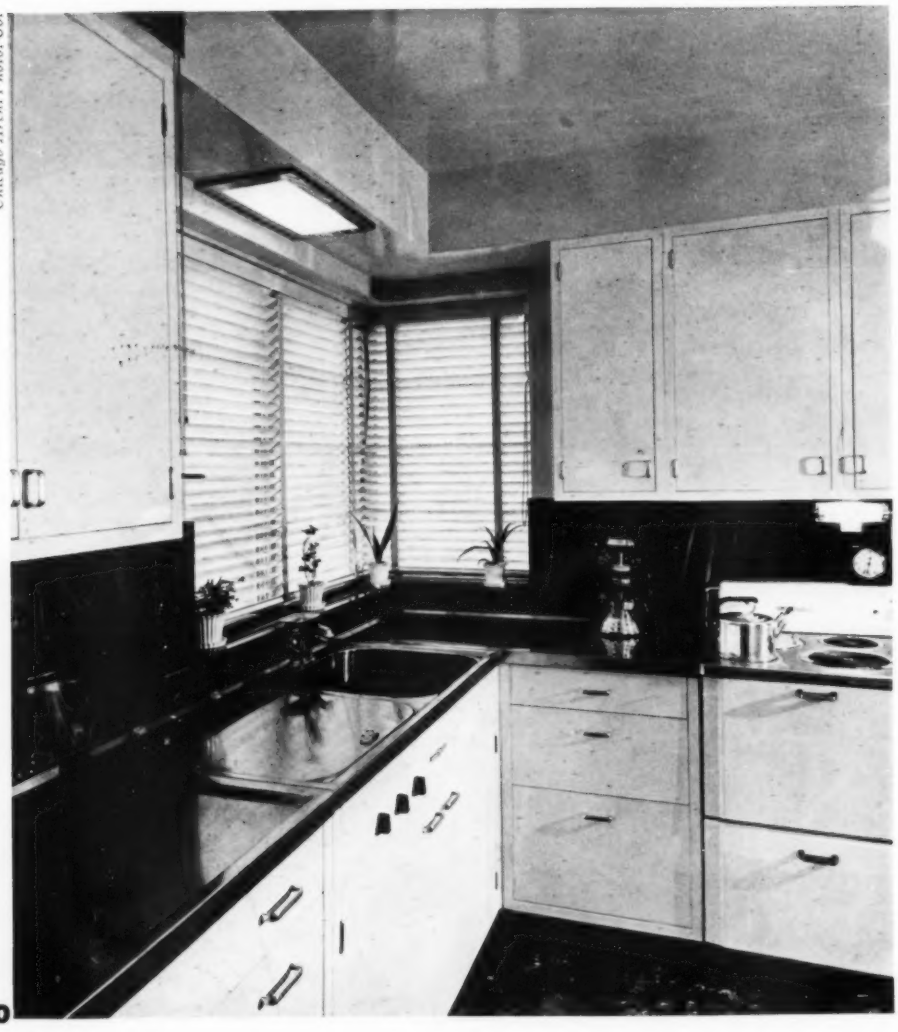
Richard Averill Smith

16

Lincoln

19

WINDOWS . . . in the Kitchen



Chicago Arch. Photo. Co.

20

Shown here are "model" kitchen and breakfast room arrangements. 20 was designed by General Electric's Home Bureau for a model house in Chicago. 21 and 22 are Detroit versions by Ditchey-Farley-Perry, architects.

21

Review of New Books

(*Continued from page 72*)

a relatively new country, one finds designers searching feverishly for precedent in the vast open spaces. One wonders again at the Greeks: how did they manage to do so well with only a few Egyptian temples behind them?

The thesis of the "natural" park designer—*Man Mars Nature*—is in reality a negation of our 20th century civilization. A nation can scarcely be considered civilized unless it lives in harmony with Nature, and this is impossible where there is a feeling of opposition between the two. The primary problem of park design is *Man plus Nature*, not *Man versus Nature*. Man is a part of the whole of nature, not something outside of it; he came from nature, and everything he produces comes from a natural source through the refinements evolved by his imagination. The park department endeavors to preserve Nature from Man, yet its basic aim is recreation—the re-creation of Man. Perhaps it is from this ambiguity of philosophy that the ambiguity of its work arises. Nature and Man are two parts of the whole: neither has meaning without the other. The question of opposition between them is an arbitrary issue.

Of course the basic difficulty is that because our cities suffer from a complete over-emphasis on building, we are forced to flee to the opposite extreme. This is a fundamental social derangement which cannot be corrected by any single governmental agency. The second supposition, that Nature is a better gardener than Man, is a completely romantic fallacy, but doubtless beyond the scope of this review.

The quality of the text deserves a word. In a publication of such potential dullness, it is indeed surprising to find the material presented with so much elegance and wit: all degrees of clarity and fogginess of thought alike receive a sugar-coating. Perhaps here we find the very core of the Beaux Arts principle—a good facade conceals any number of sins:

"This structure shelters a bromide spring." Vol. I, p. 121.

"For the pleasantly dishonest authenticity of this new-old blockhouse we are indebted to the salvaged timbers of a wrecked lake vessel." Vol. II, p. 109.

"Interpretation of the Indian tepee in wooden architecture is the theme... By the ultra practical among camp planners, the windows will be held to be of insufficient size. To these, architects will willingly stand up in debate; larger windows would obscure the provenance of this interesting adaptation." Vol. III, p. 171.

"Here is a novel departure from the stereotyped T-shaped dining lodge plan. Substituting an octagon for the crossing of the T produces a structure of refreshing individuality...." Vol. III, p. 170.

GARRETT ECKBO.

THE DESIGN OF NURSERY AND ELEMENTARY SCHOOLS. H. Myles Wright and R. Gardner-Medwin. Architectural Press, London, 1938. Liberally illustrated, with bibliography and index. 120 pages. 9 x 12¾ in. Price, $4.

ALTHOUGH COMPILED for British architects and drawing almost exclusively upon European experience, this book should nevertheless prove to be of great interest to American school designers. In the first place, the authors face a problem with which American school specialists are increasingly familiar—that of an educational system whose social responsibility is rapidly expanding in both size and complexity. And, flowing out of this fact, there is the further one that educational standards are not only in flux but are being constantly raised.

This trend the authors see as imposing new demands on the architect. He must have a more dynamic definition of education—"the process by which each child is helped to prepare itself for adult life." His schools must provide more facilities than hitherto, since "all but a trivial number of elementary school children have no opportunities for cultural and physical development outside those provided by their school." Finally, his schools must be flexible, subject to economical modification, alteration or demolition.

"It seems quite clear that the solid stereotyped buildings of fifty years ago are entirely out of place in this connection. The demand is for light buildings, with little of the classroom about them, arranged with a view to freedom and variety of use, to possible enlargement and even replacement in the not too far future."

The book is well-organized and well-documented. A general introduction interprets the policies of the (national) Board of Education and analyzes the structure of the British educational system. Each sub-type—nursery-infant, elementary, junior high—is then subjected to a standard analysis. A general summary and bibliography complete the study.

STEEL CONSTRUCTION. By Henry J. Burt; revised by C. H. Sandberg. American Technical Society, 1939. Illustrated with photographs and drawings. 437 pages. 5¾ x 8½ in. Price, $3.50.

A THOROUGHLY revised and enlarged edition of "Steel Construction" to bring it up to the present in steel construction practice; rearranged into chapter form for a more convenient use. Additional chapters have been written to cover present steel building design more completely.

The book deals with facts and formulas necessary for transforming proposed designs into tangible structures. All necessary data needed in designing the structural steel framework for buildings are conveyed to the student by illustrations of a practical nature which serve not only to teach the proper application, but to illustrate current practice in this form of construction. It is a book to be used as a text book by students and as a reference by designers.

AIR CONDITIONING FOR COMFORT. By Samuel R. Lewis. Keeney Publishing Co., Inc., Chicago. Third Edition, 1938. Diagramatic explanations included. 285 pages. 6 x 9 in. Price, $2.50.

THIS NEW edition of Lewis' well-known book on "Air Conditioning for Comfort" has been completely rewritten, revised, and enlarged and embodies the experience resulting from use of the two earlier editions in almost daily practice. It will be found valuable as a text for school and home study use, as well as a reference for contractor, engineer, architect, and owner or prospective owner of an air-conditioning system. The author is recognized as an authority on the subject.

(*Continued on page 122*)

Current Trends of Building Costs

Compiled by Clyde Shute, Manager, Statistical and Research Division, F. W. Dodge Corporation, from data collected by E. H. Boeckh & Associates, Inc.

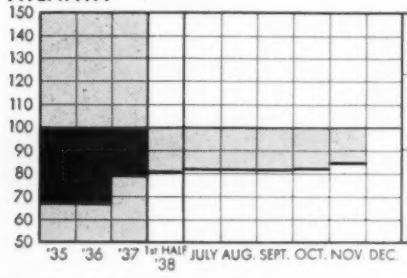
CURVES INDICATE control trends in the combined material and labor costs in the field of residential frame construction, the monthly curves being an extension of the local cost averages during the years 1935, 1936, and 1937. The base line, 100, represents the U. S. average for 1926-1929.

Tabular information gives cost index numbers relative to the 100 base for nine common classes of construction, thus showing relative differences as to construction types for this year and last.

Cost comparisons or percentages involving two localities can easily be found by dividing one of the index numbers into the difference between the two. For example: if index A is 110 and index B, 95, (110-95) ÷ 95 = .16. Thus costs in A are 16% higher than in B. Also costs in B are approximately 14% lower than in A: (110-95) ÷ 110 = .14.

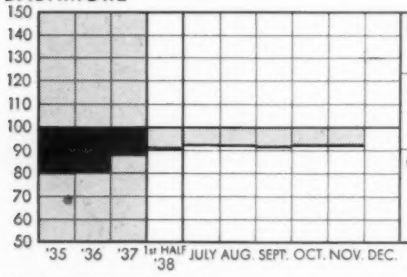
CONSTRUCTION COST INDEX U. S. average, including materials and labor, for 1926 - 1929 equals 100.

ATLANTA



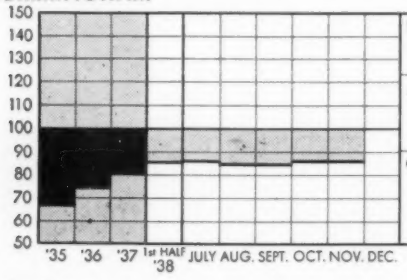
	Nov.'37	Nov.'38
Residences		
Frame	78.4	84.6
Brick	85.0	87.4
Apartments		
Br. & Wood	82.8	87.7
Br. & Conc.	94.2	96.5
Br. & Steel	93.7	96.9
Comm. & Fact.		
Frame	75.6	82.8
Br. & Wood	86.9	89.5
Br. & Conc.	96.7	98.4
Br. & Steel	94.8	96.5

BALTIMORE



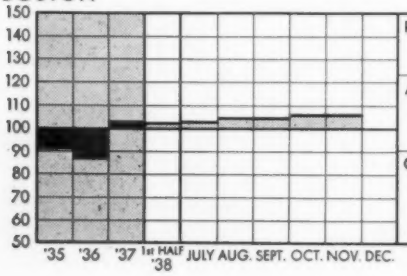
	Nov.'37	Nov.'38
Residences		
Frame	91.6	92.2
Brick	97.4	95.2
Apartments		
Br. & Wood	94.7	94.2
Br. & Conc.	98.1	98.4
Br. & Steel	97.7	98.0
Comm. & Fact.		
Frame	90.6	91.9
Br. & Wood	97.8	95.9
Br. & Conc.	98.6	99.1
Br. & Steel	100.6	98.6

BIRMINGHAM



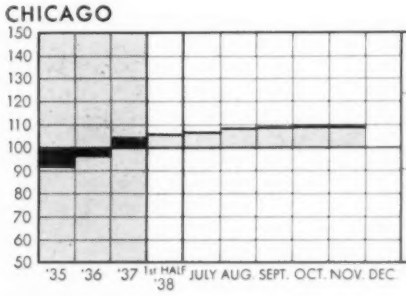
	Nov.'37	Nov.'38
Residences		
Frame	82.0	86.6
Brick	88.7	89.6
Apartments		
Br. & Wood	86.3	90.0
Br. & Conc.	92.3	95.2
Br. & Steel	91.6	92.2
Comm. & Fact.		
Frame	79.5	84.1
Br. & Wood	92.2	94.2
Br. & Conc.	94.2	96.2
Br. & Steel	92.8	94.7

BOSTON



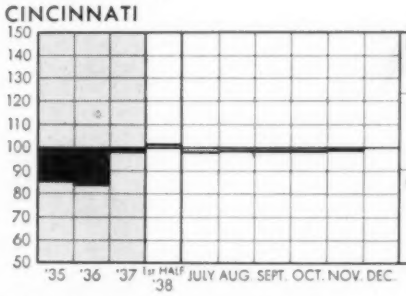
	Nov.'37	Nov.'38
Residences		
Frame	102.7	105.9
Brick	110.3	109.8
Apartments		
Br. & Wood	106.6	109.3
Br. & Conc.	113.3	115.7
Br. & Steel	110.9	112.9
Comm. & Fact.		
Frame	102.6	105.6
Br. & Wood	108.0	110.6
Br. & Conc.	114.9	118.2
Br. & Steel	116.8	117.1

CHICAGO



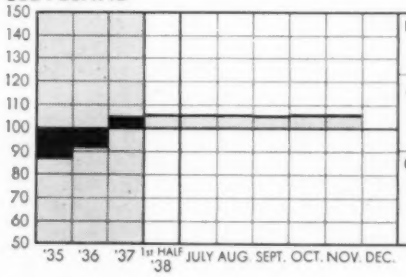
	Nov.'37	Nov.'38
Residences		
Frame	105.4	109.0
Brick	111.9	111.3
Apartments		
Br. & Wood	107.8	109.8
Br. & Conc.	121.0	122.7
Br. & Steel	115.9	117.7
Comm. & Fact.		
Frame	108.4	112.3
Br. & Wood	106.2	108.5
Br. & Conc.	124.9	126.6
Br. & Steel	121.4	121.3

CINCINNATI



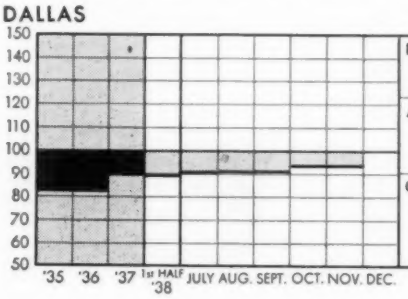
	Nov.'37	Nov.'38
Residences		
Frame	101.0	99.7
Brick	109.7	103.1
Apartments		
Br. & Wood	105.3	103.1
Br. & Conc.	111.9	111.8
Br. & Steel	109.5	108.5
Comm. & Fact.		
Frame	100.7	99.6
Br. & Wood	107.8	104.7
Br. & Conc.	115.6	113.6
Br. & Steel	113.9	112.4

CLEVELAND



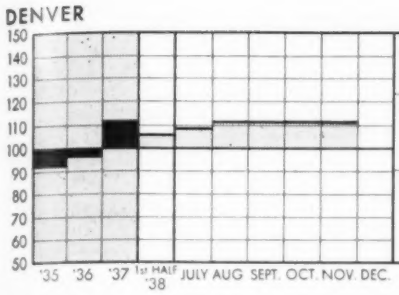
	Nov.'37	Nov.'38
Residences		
Frame	105.9	105.6
Brick	113.8	108.8
Apartments		
Br. & Wood	109.4	108.8
Br. & Conc.	115.8	114.0
Br. & Steel	112.2	111.9
Comm. & Fact.		
Frame	107.2	107.2
Br. & Wood	110.5	108.6
Br. & Conc.	119.9	115.9
Br. & Steel	118.3	116.2

DALLAS



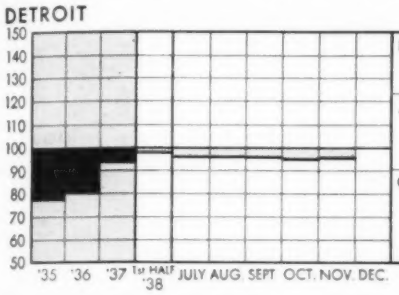
	Nov.'37	Nov.'38
Residences		
Frame	89.6	93.6
Brick	94.4	94.4
Apartments		
Br. & Wood	91.7	95.0
Br. & Conc.	91.2	98.9
Br. & Steel	93.3	99.3
Comm. & Fact.		
Frame	88.2	93.3
Br. & Wood	93.1	94.9
Br. & Conc.	90.5	98.4
Br. & Steel	93.9	101.5

DENVER



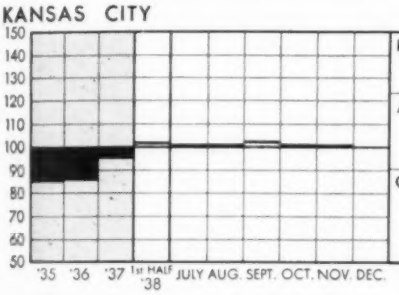
	Nov.'37	Nov.'38
Residences		
Frame	117.7	111.1
Brick	120.7	110.6
Apartments		
Br. & Wood	115.2	109.7
Br. & Conc.	116.0	114.9
Br. & Steel	115.3	113.2
Comm. & Fact.		
Frame	121.3	113.5
Br. & Wood	111.8	108.1
Br. & Conc.	117.4	116.2
Br. & Steel	118.8	116.0

DETROIT



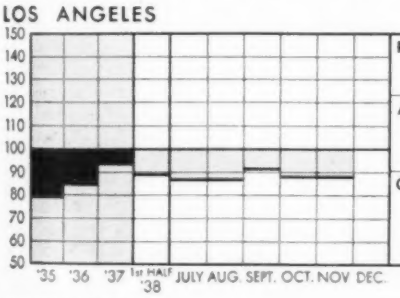
	Nov.'37	Nov.'38
Residences		
Frame	97.8	95.8
Brick	105.1	100.5
Apartments		
Br. & Wood	101.8	100.9
Br. & Conc.	108.6	108.5
Br. & Steel	107.1	107.1
Comm. & Fact.		
Frame	97.9	95.3
Br. & Wood	102.5	102.8
Br. & Conc.	110.8	110.3
Br. & Steel	112.4	111.7

KANSAS CITY



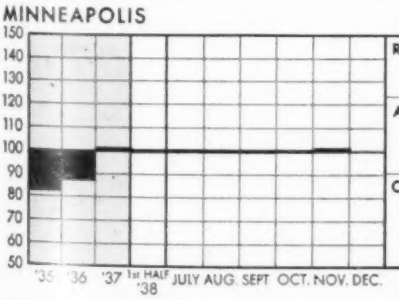
	Nov.'37	Nov.'38
Residences		
Frame	97.3	101.2
Brick	106.5	107.2
Apartments		
Br. & Wood	103.3	107.2
Br. & Conc.	114.7	117.8
Br. & Steel	111.4	114.8
Comm. & Fact.		
Frame	95.7	100.5
Br. & Wood	107.3	110.4
Br. & Conc.	117.6	121.2
Br. & Steel	118.0	119.0

LOS ANGELES



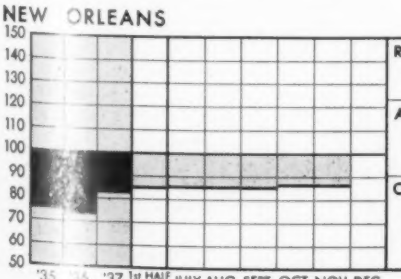
	Nov.'37	Nov.'38
Residences		
Frame	94.5	88.4
Brick	98.6	94.8
Apartments		
Br. & Wood	95.3	94.7
Br. & Conc.	98.8	102.7
Br. & Steel	101.1	103.3
Comm. & Fact.		
Frame	95.7	92.4
Br. & Wood	93.4	94.1
Br. & Conc.	94.6	103.9
Br. & Steel	104.2	102.7

MINNEAPOLIS



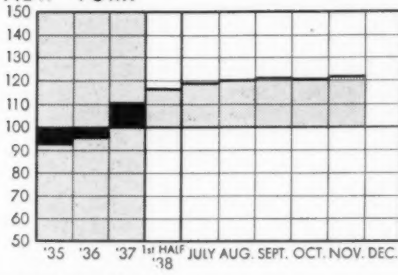
	Nov.'37	Nov.'38
Residences		
Frame	103.7	100.8
Brick	110.0	104.2
Apartments		
Br. & Wood	105.8	103.5
Br. & Conc.	112.9	113.5
Br. & Steel	111.1	111.0
Comm. & Fact.		
Frame	105.3	101.4
Br. & Wood	104.3	103.2
Br. & Conc.	116.2	117.6
Br. & Steel	115.7	114.6

NEW ORLEANS



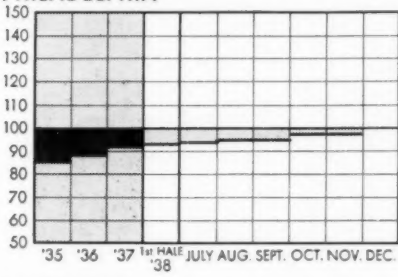
	Nov.'37	Nov.'38
Residences		
Frame	84.7	86.3
Brick	88.1	87.9
Apartments		
Br. & Wood	85.9	89.0
Br. & Conc.	88.1	92.8
Br. & Steel	91.9	96.0
Comm. & Fact.		
Frame	84.3	85.5
Br. & Wood	85.9	89.6
Br. & Conc.	86.4	91.9
Br. & Steel	91.9	96.0

NEW YORK



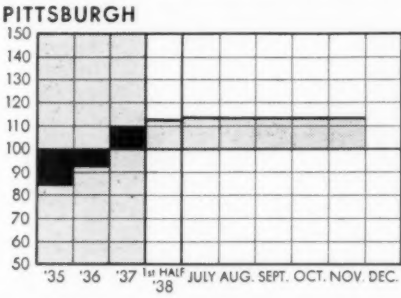
	Nov.'37	Nov.'38
Residences		
Frame	113.5	121.2
Brick	119.6	122.4
Apartments		
Br. & Wood	115.1	121.7
Br. & Conc.	126.6	130.1
Br. & Steel	122.3	125.3
Comm. & Fact.		
Frame	115.3	124.4
Br. & Wood	113.8	118.9
Br. & Conc.	128.1	132.8
Br. & Steel	126.6	129.3

PHILADELPHIA



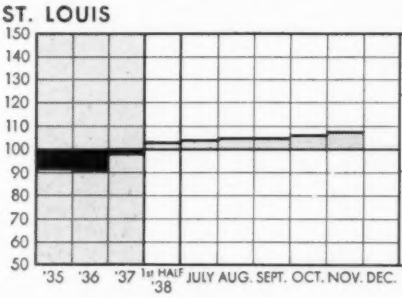
	Nov.'37	Nov.'38
Residences		
Frame	90.8	97.5
Brick	97.3	101.5
Apartments		
Br. & Wood	95.0	101.5
Br. & Conc.	98.9	105.3
Br. & Steel	99.0	102.9
Comm. & Fact.		
Frame	87.7	97.2
Br. & Wood	98.1	103.7
Br. & Conc.	101.2	106.2
Br. & Steel	101.6	104.1

PITTSBURGH



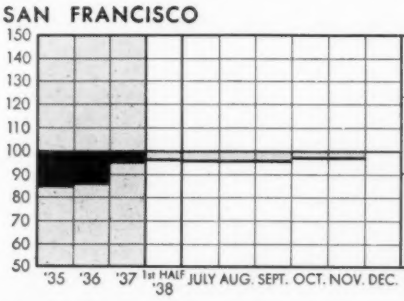
	Nov.'37	Nov.'38
Residences		
Frame	113.7	113.2
Brick	121.8	116.8
Apartments		
Br. & Wood	117.3	115.0
Br. & Conc.	118.6	117.0
Br. & Steel	115.2	113.5
Comm. & Fact.		
Frame	113.0	113.4
Br. & Wood	119.8	116.0
Br. & Conc.	120.3	118.8
Br. & Steel	118.2	116.4

ST. LOUIS



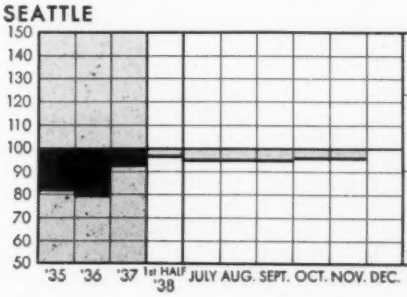
	Nov.'37	Nov.'38
Residences		
Frame	98.7	108.1
Brick	107.4	111.0
Apartments		
Br. & Wood	104.0	110.9
Br. & Conc.	114.7	119.1
Br. & Steel	113.0	117.1
Comm. & Fact.		
Frame	98.5	108.6
Br. & Wood	106.2	110.9
Br. & Conc.	119.1	120.1
Br. & Steel	119.0	120.5

SAN FRANCISCO



	Nov.'37	Nov.'38
Residences		
Frame	97.3	97.5
Brick	106.8	105.4
Apartments		
Br. & Wood	103.4	102.2
Br. & Conc.	113.6	115.9
Br. & Steel	111.1	112.3
Comm. & Fact.		
Frame	95.6	95.9
Br. & Wood	107.0	105.9
Br. & Conc.	119.4	120.9
Br. & Steel	114.2	115.6

SEATTLE



	Nov.'37	Nov.'38
Residences		
Frame	98.0	96.3
Brick	108.6	104.1
Apartments		
Br. & Wood	105.3	103.7
Br. & Conc.	122.5	120.0
Br. & Steel	116.4	115.8
Comm. & Fact.		
Frame	95.8	93.9
Br. & Wood	109.6	108.3
Br. & Conc.	126.7	126.3
Br. & Steel	122.1	120.6

An Air Conditioned School..

WITH A COMPLETE

MINNEAPOLIS-HONEYWELL

PNEUMATIC CONTROL SYSTEM

THE first unit of the new Municipal University of Omaha is one of America's first air conditioned schools. In every respect, this new building represents the last word in school design and construction. It is, therefore, significant that both the winter heating cycle and the summer cooling cycle are completely controlled by a Minneapolis-Honeywell Pneumatic Control System. Each Minneapolis-Honeywell Control System is engineered for its individual installation. Only Minneapolis-Honeywell offers a complete line of controls—Pneumatic, Electric or a combination of both. M-H Engineers can therefore give you unbiased advice in the selection of a control system for your school building. Minneapolis-Honeywell Regulator Co., 2804 Fourth Avenue South, Minneapolis, Minnesota. Branches everywhere.

The First Unit of the New Municipal University of Omaha . . . Architects: John Latenser & Sons, Inc., Omaha, Nebraska

MINNEAPOLIS-HONEYWELL

BROWN INDUSTRIAL INSTRUMENTS

NATIONAL PNEUMATIC CONTROLS

Control Systems

AUTOMATIC CONTROLS MH

BUILDING TYPES

Haskell

OFFICE BUILDINGS

ARCHITECTURAL RECORD

COMBINED WITH AMERICAN ARCHITECT AND ARCHITECTURE

Design Reference on Office Buildings

MATERIAL IN THIS REFERENCE STUDY has been compiled from a variety of sources toward the end of reporting certain standards of good practice in office building design. The subjects treated represent those phases of design which are most generally subject to a variety of solutions because of differences of technical opinion, rapid changes in the means of construction and equipment, or the force of local conditions and technical custom. Limitation of subject matter was, therefore, a self-explained necessity.

In each case an effort has been made to report performance standards in each field covered—the objective being the compilation of facts to which designers might refer in developing a specification for individual design conditions. To this end, each section of this study represents editorial research beyond the personal opinion of a single individual. From six to twelve or more individuals—each a specialist in his particular field—contributed information based on his technical experience. Statements of individuals were analyzed, edited to eliminate duplication and developed in their present form by technical members of the Record's editorial staff.

As presented, each section lists—where possible to do so—performance standards that represent the median, or the average, of currently accepted practice according to statements of the specialists who were consulted. Variations above or below this average—which might be called a basic performance value—are reflected in individual reports as published. Some represent the opinion of individuals or of groups; others indicate the force of locality or custom. All statements that relate to performance standards were either deduced or derived directly from an able body of technical opinion. Therefore readers are particularly cautioned not to regard this reference material as either blanket or specific recommendations on the part of the Record's editorial staff.

THE OBJECTIVE of any research activity is—or should be—confined to a compilation of facts. Conclusions touching on any phase of a subject cannot properly be made until facts on that subject are at hand and its condition thus exposed. So far as this Building Types Reference Study has involved collection of factual information of many sorts, it constitutes a research activity. And from it two conclusions can be drawn.

The more obvious is the startling lack of standardization in the design—planning, construction, and equipment—of structures to house highly standardized activities. Functions of office buildings are generally similar throughout the country. But provisions for these functions appear to be largely the result of designing whims, commercial fancies or the arbitrary imposition of technical experience simply because of habit or customs.

The second conclusion is the more basic in that it furnishes a reason for the wide variations that exist in the fields of technical opinion and practices. There exists an amazing scarcity of scientific data regarding the environmental needs of people who tenant office buildings. Merely as a consumer of rentable space, an office worker's physical and psychological requirements have received scant attention. As a human organism he has been all but ignored. The deduction seems inescapable that science must furnish, through research, more explicit standards of environment based upon human actions and reactions before office building design can show marked improvement from current policies and practices.

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Planning, Layout, and Clearances

IN PLANNING a commercial office building, whose success is measured in dollars and cents, the designer must analyze the site, the type of plan and structure proposed, proportions of rentable public and service areas, and code or other restrictions, so that the owner may have an understandable approximation of building costs and potential returns. These analyses are equally applicable (1) to offices for multiple tenancy and (2) to those for single company tenancy. While the following data is related principally to multiple-tenancy buildings, much of it is equally valuable in planning single-tenant structures. Considerable variation as to common practice prevents setting rigid "standards." Data presented should be regarded as a report of current trends from which a basis can be evolved for solving a particular problem.

Site coverage, according to opinions surveyed*, is almost always 100% for lowest stories; above the first floor or floors coverage is determined by the availability of light and air for rentable spaces; by code restrictions (based generally on the same factors); and by the economic relation, based on studies and analyses, between building costs and potential income from rentable area. Building height varies similarly with land values, code restrictions, and the building-cost-to-rentable-area relationship, the latter modified by the potential demand for office space.

Location and proportioning of areas

In general, according to the architectural department of Rockefeller Center, Inc., building service areas should be as close to the center lines of the building as possible. Basements usually contain the principal items of equipment: heating, ventilating, fan, electrical. Roofs may be used for air-conditioning and exhaust equipment, water storage and pressure tanks. At intermediate levels in buildings of more than 15 stories, auxiliary pumps and heaters are usually required at 15-floor intervals (Rock. Center, Inc.).

Building entrances, the consensus of opinion seems to be, should be so located that they are in the average pedestrian's instinctive line of approach. If more than one building entrance is considered, its value should be weighed against income from the displaced rentable area. W. H. Tusler gives the following figures for approximating first floor area proportions: Lobbies, stairs, foyers, 12%; rentable, 88%.

On typical rental floors, average recommendations are: Service, 31.6% (low, 15 to 25%; high, 40-50%); rentable, 68.4% (low, 50%; high, 85%). Rockefeller Center's architectural department states that building perimeter multiplied by 1.5 produces the net wall area to be deducted from gross area, and that column area is included in computing rentable area. (See also "Design Elements Affecting Rentability," page 99).

Toilets

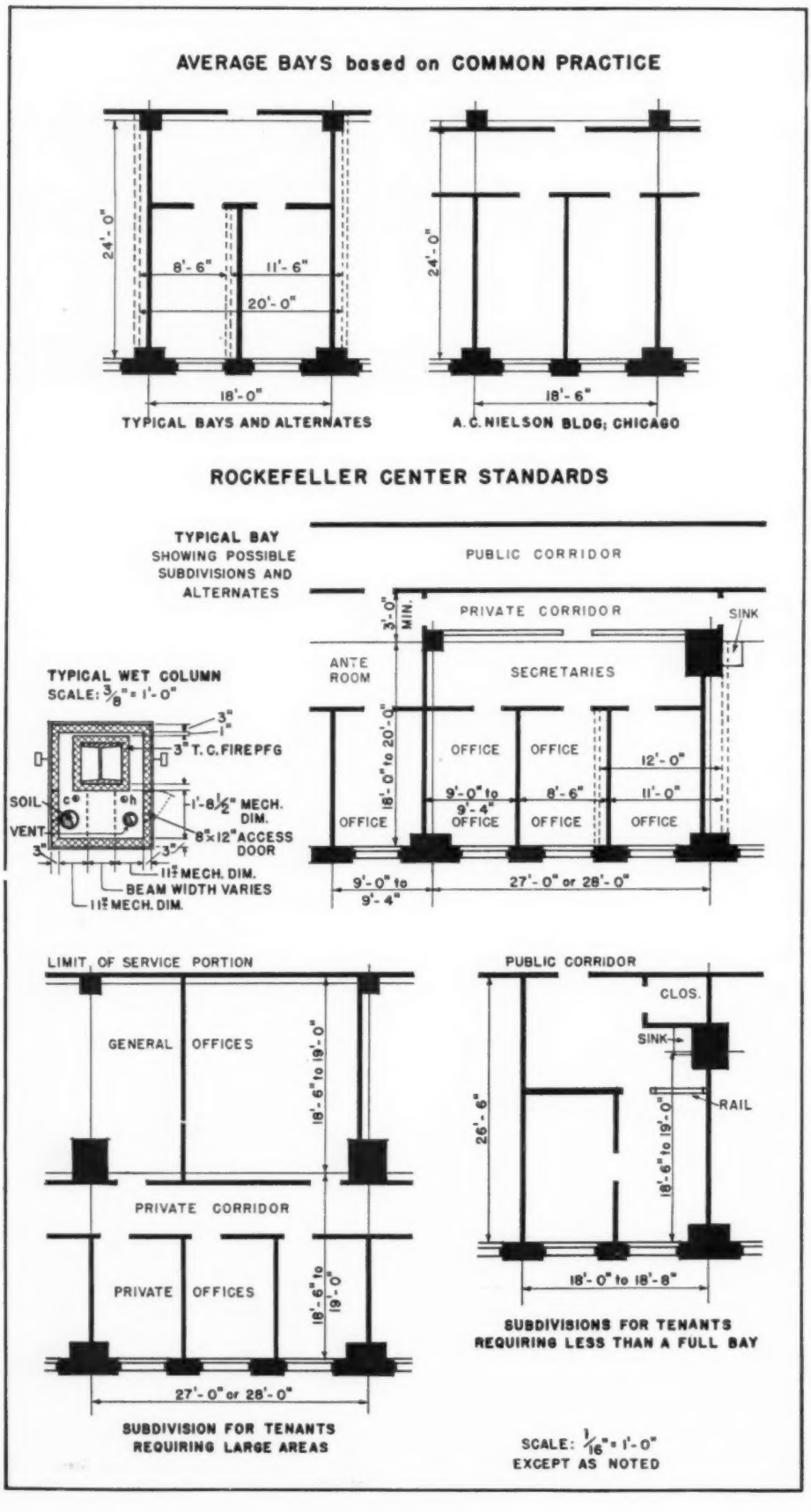
Two opinions consulted advised, for men, 1 toilet per 5000 sq. ft., 1 urinal per 10,000 sq. ft. (rentable area). The recommendations for women were, 1 toilet per 1000 to 10,000 sq. ft.—a range which cannot be averaged. Building managers (page 99) recommend, for men, 10 toilets, 4 urinals, and 2 lavatories per 30,000 sq. ft.; for women, 9 toilets, 2 lavatories per 30,000 sq. ft. Rockefeller Center supplies 1 toilet for every 10 or 15 persons; executive areas require the smaller ratio. Slop sinks, according to E. E. Probst, of Graham, Anderson, Probst and White, should average 1 per 7500 sq. ft. (rentable area). Consult sanitary and labor codes also.

Information on office building layouts, bays, courts, corridors, etc., is given in the following four pages.

*The Editors wish to acknowledge the assistance of the following in preparing the above information: Earl H. Lundin (Architectural Dept., Rockefeller Center, Inc.); Edward E. Probst (Graham, Anderson, Probst & White, Architects); W. H. Tusler (Magney, Tusler and Setter, Architects); J. D. Sandham (Kimball, Steele and Sandham, Architects).

LAYOUT

Bays, Courts, Heights, Fenestration, Corridors



The accompanying drawings have been developed from data on common practice as to bay sizes, modified by recommendations made by building managers as reported in another portion of this study. Data should not be considered mandatory standards; all should be studied in relation to the particular problem at hand. Local codes, costs, type of occupancy, and similar factors should govern.

Typical bays

Bay width termed "ideal" by Rockefeller Center, Inc., is approximately 50% larger than the average of common practice, thus eliminating 1 column in every 3 on the building's perimeter.

Bay depth, from center of outer columns to face of public corridor, averages 25 ft. to 25 ft. 6 in. on street frontages, with one consultant recommending 20 ft. depth for court or alley frontage. Rockefeller Center practice places interior columns far enough from corridor walls to permit of a private corridor between, serving suites of offices; and sets maximum rental area depth at 30 ft.

"Wet" columns, carrying hot and cold water, soil and vent stacks, are so placed in Rockefeller Center buildings that every tenant may have a lavatory within his office; in some cases, complete bathrooms are installed. Generally speaking, every alternate column is "wet."

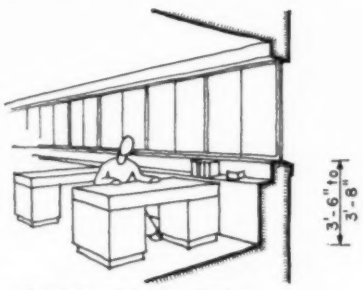
Courts

Shallow courts seem to be more generally desirable than deep ones, courts one-half as deep as they are wide being preferred. Layouts of good rentable area, considered in conjunction with code requirements as to corridor length in relation to fire stairs, elevators, etc., govern court sizes and disposition. Their prime purpose is to assure permanently good light and air to all stories.

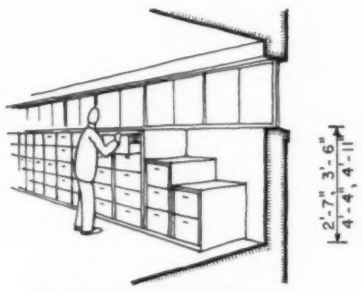
Floor heights

Average floor heights are as follows: First story, no mezzanine, 18 ft. to 21 ft. Loft floors, average 12 ft. floor to floor; general office floors,

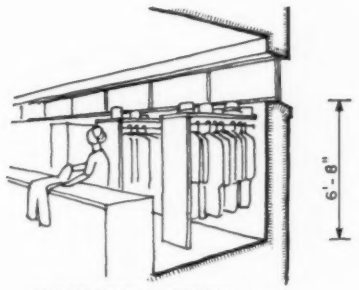
WINDOW SILL HEIGHTS, DETERMINED BY FURNITURE AND EQUIPMENT HEIGHTS



DESK, PLUS BOOK SHELF
(POSSIBLY CONCEALED RADIATION)

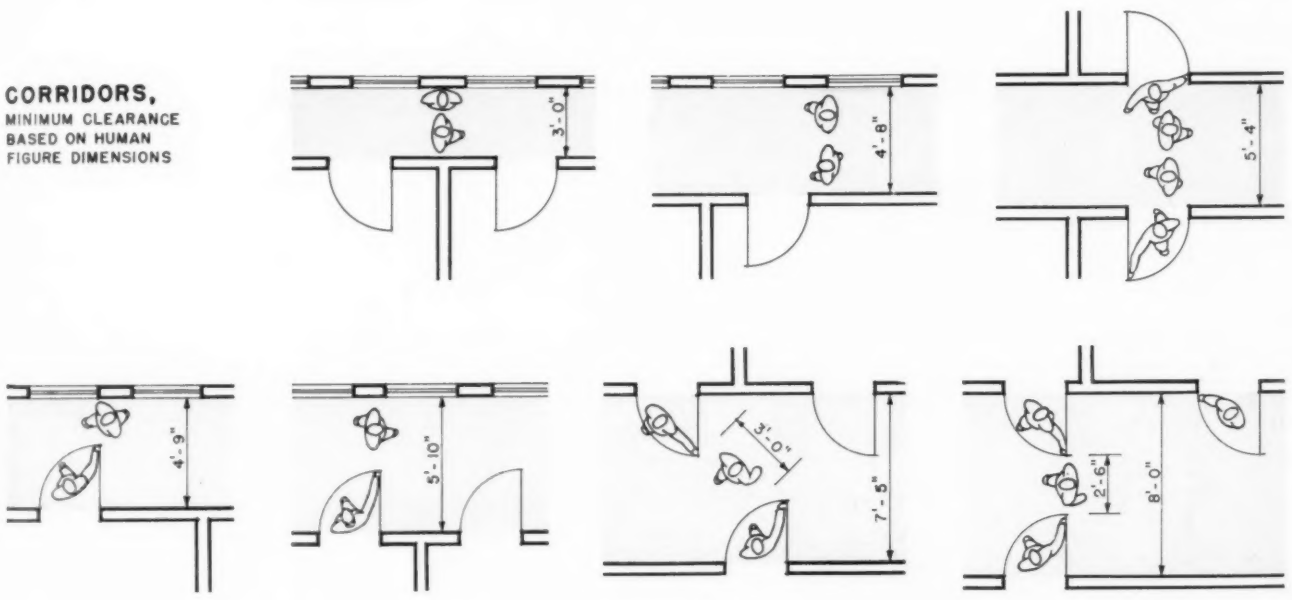


FILES, VARYING HEIGHTS
CORRESPONDING TO STANDARD
FILE DIMENSIONS



CLOAK ROOM, HANGING
ROD PLUS HAT SHELF

CORRIDORS,
MINIMUM CLEARANCE
BASED ON HUMAN
FIGURE DIMENSIONS



SCALE FOR ALL DRAWINGS 1/8" = 1'-0"

9 ft. 6 in. to 11 ft. 6 in., 9-ft. clear height being the minimum recommended. Interior doors are usually 7 ft. high; door plus transom, 8 ft. 6 in.

Fenestration

Great variation exists in window size and area recommendations. Individual window width apparently varies from 4 ft. to 5 ft. 3 in.; height, from 6 ft. 6 in. to 8 ft. Height is most often controlled by floor to floor height, one recommendation being that window heads be within 6 in. of the underside of the spandrel beam, another that heads be 2 ft. 6 in. from the finish floor above. Sill heights are relatively standardized at approximately 2 ft. 6 in., although some are as high as 3 ft. The accompanying sketches illustrate methods of determining sill heights in special cases where furniture or equipment can govern.

Window area recommendations range from 10% of rentable floor area to 50% of the building's perimeter. "Light shafts" are not normally recommended.

Corridors and lobbies

Elevator lobbies serving 4 cars are considered satisfactory if 6 ft. wide, according to one opinion; others state that lobbies with elevators on 1 side should be 9 ft. wide; with cars on 2 sides 11 or 12 ft. wide. In Rockefeller Center, 10-ft. width is standard. In general the desirable maximum length of an elevator bank is 6 cars.

Corridors on typical floors show the same variation. The average, outside New York, seems to be 6 ft. in width, with widths for short corridors (1 or 2 bays) ranging from 4 ft. to 5 ft. 6 in.; for medium-length corridors, 5 ft. to 6 ft. 6 in.; for long corridors, 6 ft. to 7 ft. Rockefeller Center corridors average 5 to 6 ft. Minimum corridor width is set by some codes, in which case it must equal the minimum exit door width. Methods for determining corridor width in accordance with human figure dimensions are shown in the drawings.

CLEARANCES

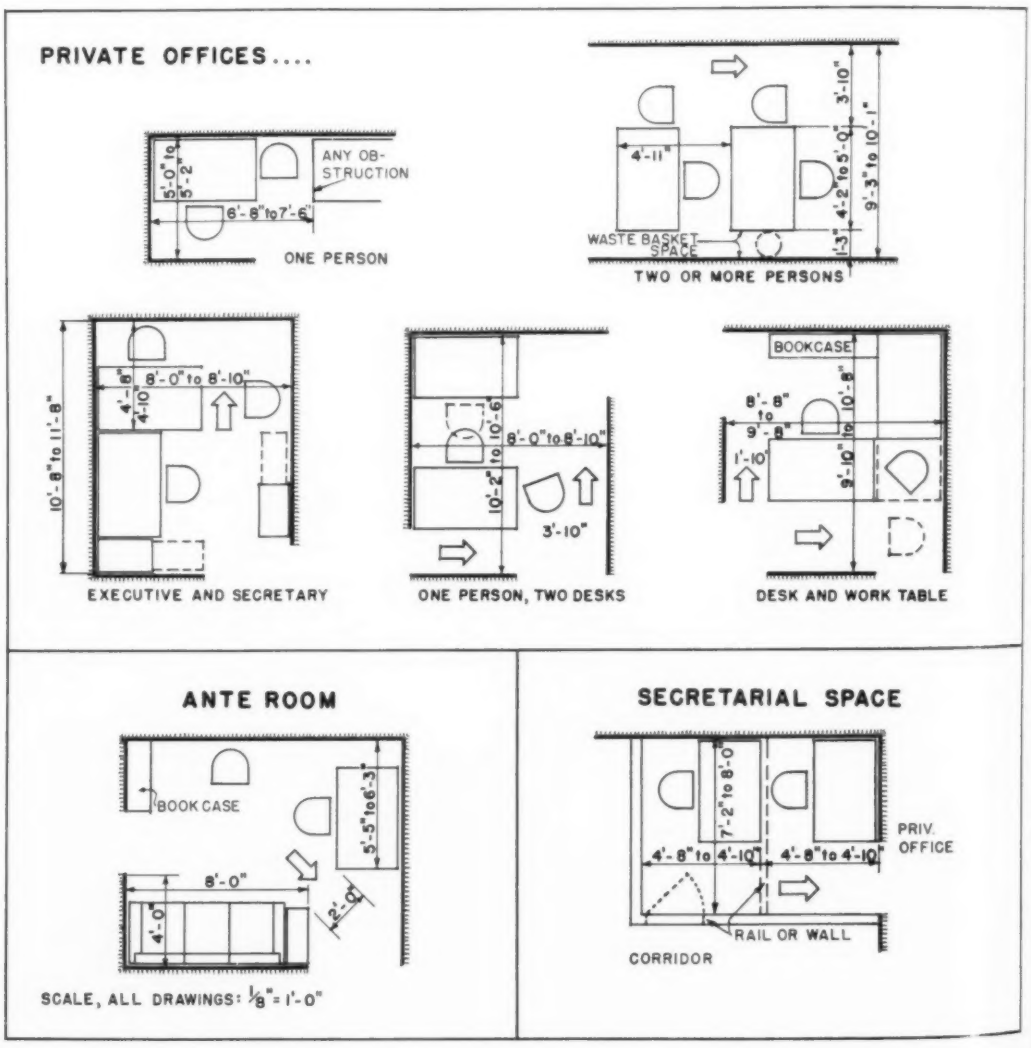
Minima for Private Offices

THESE TWO pages contain information on average minimum clearances necessary around typical units of office furniture under various typical conditions.

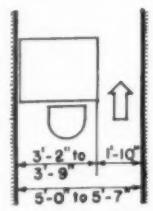
Use of this type of data will enable building designers to lay out interior portions of office buildings economically and to determine spans or bay dimensions which will most efficiently serve various departments or types of office space. In the case of buildings for general occupancy, tenant layout designers may find the data useful in setting up standards applying to their particular needs.

Data are based on standard office furniture and equipment sizes plus dimensions of the human figure, and were in part adapted from "Bau-Entwurfslehre" (Architectural Design) by Prof. Ernst Neufert. Minima for reasonably comfortable human occupancy, passage, etc., are given, rather than absolute minima; and the high valuation per square foot of office space was carefully considered in their development. Variations in dimensions are principally due to variations in furniture sizes. Dimensions read to obstructions, usually walls, partitions, columns, files, etc.; but in certain cases low obstructions such as desks, rails, etc., will require less clearance than high obstructions. In such cases, from 6 in. to 1 ft. should be added to given clearances if high obstructions exist.

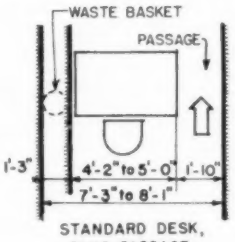
Drawings for executives' offices, anterooms, and secretarial spaces are similarly developed. Space or room limitations indicated are not to be considered the only typical conditions. They are intended to serve as guides in the development of plans suited to the particular conditions at hand.



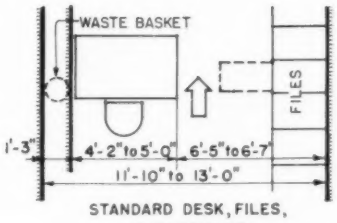
DESKS....



TYPIST, PLUS PASSAGE



STANDARD DESK, PLUS PASSAGE



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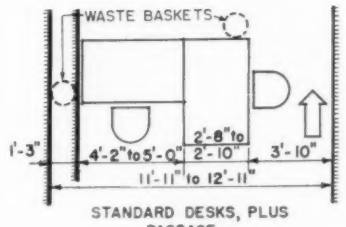
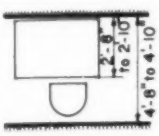
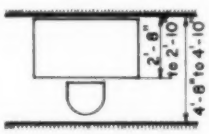


STANDARD DESKS, PLUS PASSAGE



TYPIST, NO PASSAGE



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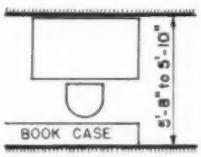
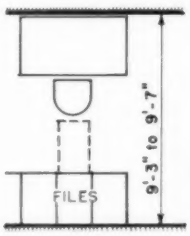
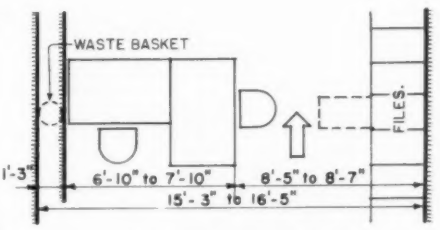


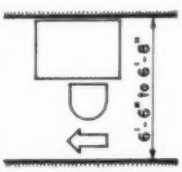
STANDARD DESK PLUS BOOKCASE



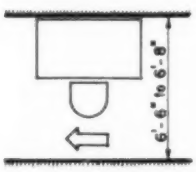
STANDARD DESK, PLUS FILES



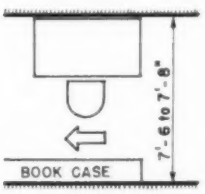
STANDARD DESKS, PLUS FILES, AND PASSAGE



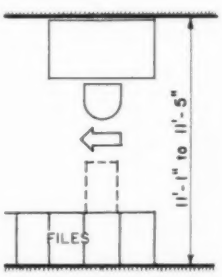
TYPIST, PLUS PASSAGE



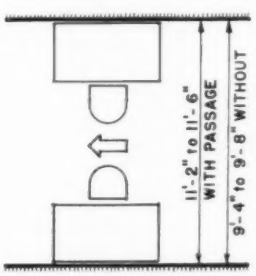
STANDARD DESK, PLUS PASSAGE



STANDARD DESK, PLUS BOOKCASE, AND PASSAGE



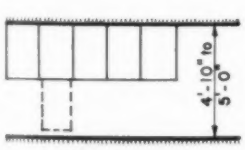
STANDARD DESK, PLUS FILES AND PASS.



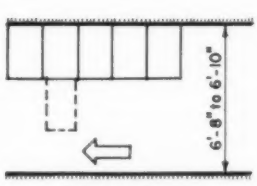
STANDARD DESKS, BACK TO BACK, PLUS PASSAGE

FILES....

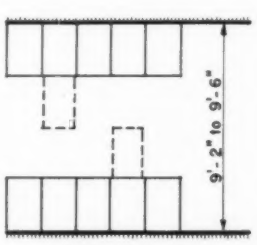
STANDARD CLEARANCES FOR BOTH LEGAL AND LETTER SIZES



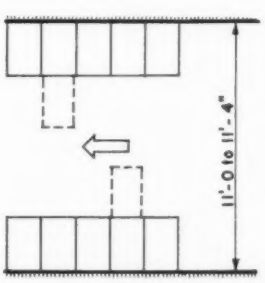
PASSAGE, DRAWERS CLOSED ONLY



PASSAGE, DRAWER OPEN



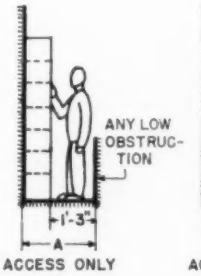
FILES, FACE-TO-FACE PASSAGE WITH DRAWERS CLOSED ONLY



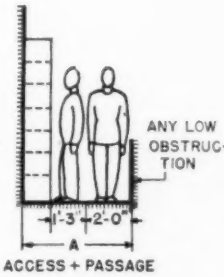
FILES, FACE-TO-FACE PASSAGE, DRAWERS OPEN

SHELVING....

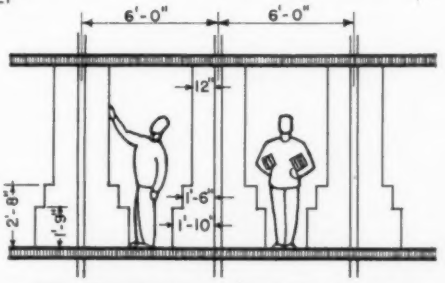
MANY DEPTHS ARE AVAILABLE; USUAL MINIMUM FOR A, EQUALS TWICE SHELF DEPTH, TO PERMIT EASY REMOVAL OF CONTENTS



ACCESS ONLY



ACCESS + PASSAGE



ONE ARRANGEMENT, SUITABLE FOR LIBRARIES, STOCK ROOMS, ETC.

SCALE FOR ALL DRAWINGS
1/8" = 1'-0"

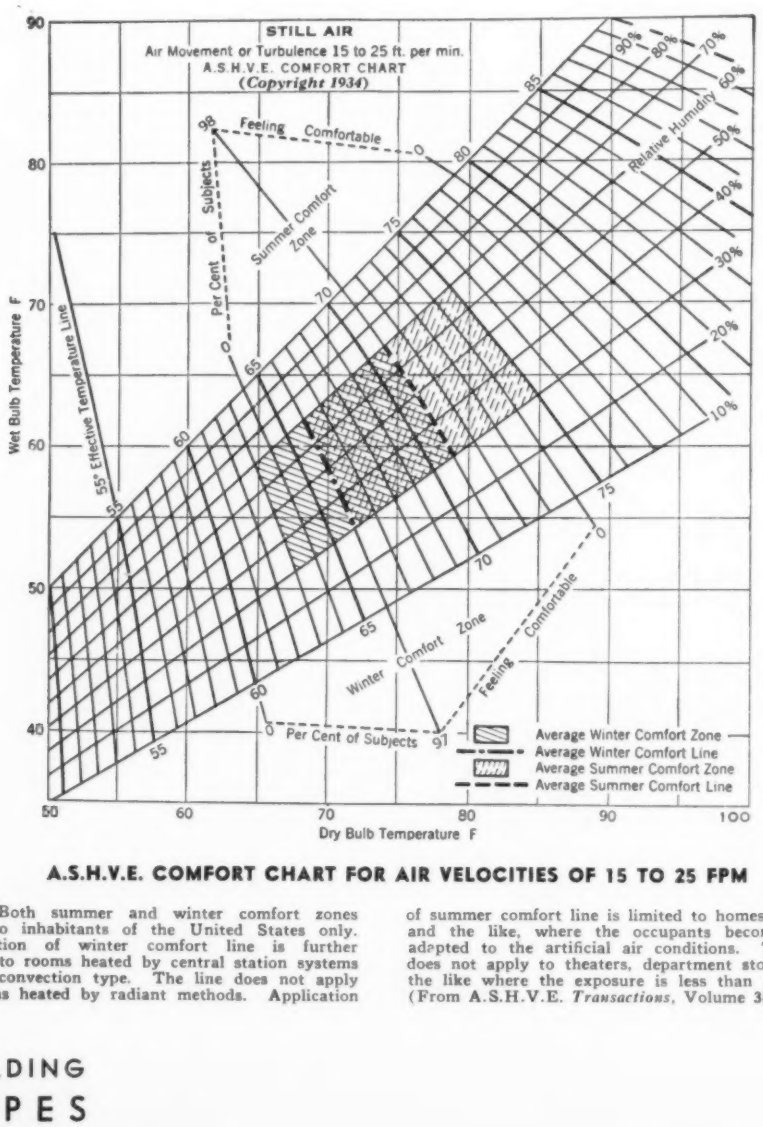
SUMMER AIR CONDITIONING

Acceptable Performance Standards

INSIDE DESIGN CONDITIONS FOR COMFORT COOLING

Outside Design Dry Bulb	CLASS AA SPECIAL APPLICATION OCCUPANCY OVER 40 MIN.			CLASS A AVERAGE APPLICATION OCCUPANCY OVER 40 MIN.			CLASS B OCCUPANCY UNDER 40 MIN.		
	Dry Bulb	Wet Bulb	R.H.%	Dry Bulb	Wet Bulb	R.H.%	Dry Bulb	Wet Bulb	R.H.%
85	73	64	64	74	64	60	75	64	57
	74	62	53	75	62	50	76	63	48
	75	61	45	76	61	43	77	61	41
	76	59	38	77	59	35	78	59	32
90	75	66	65	77	67	62	78	68	60
	76	65	57	78	66	53	79	66	53
	77	63	48	79	65	48	80	65	45
	78	62	41	80	63	40	81	64	40
95	77	67	60	79	68	58	81	69	55
	78	66	54	80	67	51	82	68	49
	79	65	47	81	66	45	83	67	44
	80	64	42	82	65	40	84	66	38
100	78	69	65	80	69	58	82	70	57
	79	68	57	81	68	52	83	69	51
	80	66	50	82	66	44	84	68	45
	81	65	43	83	65	38	85	67	38
105	79	69	63	81	70	58	83	71	57
	80	68	57	82	68	51	84	70	50
	81	67	49	83	67	45	85	69	45
	82	66	43	84	66	39	86	68	40

From the Interim Code (1936) of the Air Conditioning Manufacturers' Association



A.S.H.V.E. COMFORT CHART FOR AIR VELOCITIES OF 15 TO 25 FPM

Note.—Both summer and winter comfort zones apply to inhabitants of the United States only. Application of winter comfort line is further limited to rooms heated by central station systems of the convection type. The line does not apply to rooms heated by radiant methods. Application of summer comfort line is limited to homes, offices, and the like, where the occupants become fully adapted to the artificial air conditions. The line does not apply to theaters, department stores, and the like where the exposure is less than 3 hours. (From A.S.H.V.E. *Transactions*, Volume 38, 1932.)

SUMMER AIR CONDITIONING in office buildings is still a matter of controversy; scientifically, technically, and commercially. Scientifically there exists no set of conclusive physiological standards that can be used as a general basis for performance specifications.

A start has been made toward establishing such standards. Experiments are now being made in an attempt to establish more definite comfort and health limits for air velocity, air purity, temperature, and humidity than now exists. The American Society of Heating and Ventilating Engineers are conducting tests in Canada, Pittsburgh, and Texas to supplement information already compiled. Prominent among university scientists who are studying the same subjects are Dr. C. E. A. Winslow, Professor of Public Health at Yale and Dr. C. P. Yaglou, Assistant Professor of Industrial Hygiene of the Harvard University School of Public Health. In addition, a Committee on Air Conditioning of the American Medical Association, chairmanned by Dr. Carey P. McCloud of the Detroit City Bureau of Hygiene, has been studying various aspects of the problem but so far has withheld its findings.

Because of this compound situation, the building designer has no choice but to exercise his judgment and adjust the experience and recommendations of others to the set of conditions peculiar to his locality and building problems.

To provide an outline basis for this, the following paragraphs list commonly accepted limits of temperature, relative humidity, and air motion and reflect variation of opinion and practice where it is known to exist.

Temperature and relative humidity

Temperature cannot be arbitrarily set, for its effect on human beings varies materially with the percentage of relative humidity and degree of air motion. The A.S.H.V.E. "Comfort Chart" suggests a range of temperatures and humidities based on laboratory experiments. Though it may serve as a basis for adjustment to local conditions, it takes no account of significant factors invariably encountered in practice—costs, prevailing conditions of outdoor air, and the varied effects of temperature-changes upon people.

Opinion on the value of such practical matters as they may affect per-

formance specification can be classed, generally, in three groups: The *first* advocates maintenance of nearly optimum conditions (approximately 71 F and 50% R.H.) inside with little or no regard for temperature differences between out- and indoors. The *second* favors a comparatively low temperature (dry bulb) and high humidity (70 F to 75 F with 70 to 80% R.H.) also with little regard to outdoor conditions; and the *third* a higher temperature, varying with the range of outdoor temperatures, with a comparatively low and fairly constant humidity (30 to 45% R.H.)

There exists considerable engineering opinion that the A.S.H.V.E. summer comfort zone is a compromise, influenced by what has been economically practical to attain, and that a range between 70 F with 50% R.H. and 85 F with 30% R.H. comes closer to reflecting generally desirable conditions. In adjusting any recommendation to local conditions it should be borne in mind that these are expressed in terms of Northern practice. In warmer climates higher temperatures can be tolerated; and the comfort range can therefore be considered as from 1 to 10 degrees above figures cited here.

It has been established that both comfort and health are aided by avoiding shock resulting from wide and sudden changes of temperature. Corresponding variations in humidity appear relatively unimportant as they concern health, although they have a marked effect on comfort. Adoption in principle of any one of the three relationships, therefore, depends largely upon prevailing outdoor conditions and the local average tolerance of people to these conditions.

No general agreement appears to exist regarding temperature differentials to avoid shock—probably because physiological tolerances have not yet been completely charted and also because of the varying effects of humidity and air motion. A large body of opinion regards 15 degrees as the desirable maximum without regard to relative humidity or air motion. Another group sets a much lower differential—from 5 to 8 degrees—coupled with comparatively low relative humidity and above-normal air motion.

The accompanying tabulation represents the design conditions recommended for summer air conditioning as part of the Interim Code of the Air Conditioning Manufacturers' Association.

Air motion

A range of 15 to 25 fpm is considered calm air and is generally regarded as desirable during the heating season in rooms of ordinary temperature (68 to 71 F dry bulb). With temperature 2 or more degrees lower, drafts are likely to occur when air motion is 40 fpm or over. At higher temperatures—80 F or above—velocities can be considerably increased.

Regarding practical limits of air velocity a variety of opinion exists. As with temperature and relative humidity, air motion has varying effects on people. Few of these effects have been sufficiently researched to provide a scientific basis for setting velocity limits for commonly encountered conditions.

It is probably a fact that persons of sedentary occupation are most generally susceptible to draft effects and, therefore, the desirable air motion for summer air conditioning in office spaces should not usually be greater than 50 fpm within the room. However, Samuel P. Brown states as an opinion based on experience, "in summer, so long as the cool air supplied is well mixed with room air before contacting occupants, velocities as high as 125 fpm. have been satisfactorily used. Such higher velocities decrease the effective temperature because of the velocity effect alone, thus relaxing requirements on dry bulb temperature and humidity."

General practice allows 6 to 8 air changes per hour as satisfactory. It is common practice to recirculate from one-third to three-quarters of inside air depending on requirements and the type of mechanical means employed. Therefore 6 air changes per hour *through the machines* would mean replacement of inside air from 2 to 4 times per hour.

Provided outside air is adequately conditioned, the higher figure reflects the more generally desirable condition from a health point of view.

Air purity

This is still a subject for research as it refers to a scientifically desirable standard for office spaces. Some form of air cleaning device is generally regarded as an essential part of air-conditioning equipment. But choice of the three principal types—filters, air washers, and electrical precipitation devices—depends largely upon the relative purity of local air. Also the efficiency of air washers and filters varies widely. Electrical precipitation of dust particles is basically the most efficient; but it is a relatively new method for cleaning air and still comparatively expensive.

Removal of odors necessitates a sufficiently large proportion of outside air to overcome the odor by dilution. Odor tolerances are not standardized and for office buildings are regarded as relatively unimportant if other functions of summer air conditioning operate satisfactorily.

References

The foregoing report was compiled from a number of sources. Acknowledgment is given to the following individuals, but readers are cautioned not to ascribe statements to any one person unless otherwise noted: Samuel P. Brown, Research Corporation; R. E. Cherne, Carrier Corporation; A. R. Mumford, Research Engineer, the New York Steam Corporation; Clifford F. Holske, American Ice Company; F. O. Urban, General Electrical Company; C. H. B. Hotchkiss, Editor, and Clifford Strock, Associate Editor, Heating and Ventilating Magazine.

Bibliography

For reports on current progress toward scientific development of health and comfort standards refer to: Bulletins of the U. S. Public Health Service, Washington, D. C.; Transactions of the American Society of Heating and Ventilating Engineers and issues of the American Journal of Public Health, New York, N. Y.; Heating and Ventilating, New York, N. Y.; and Heating, Piping and Air Conditioning, New York, N. Y.

Recently published technical books on installation standards and methods include: Air Conditioning for Comfort, by Samuel R. Lewis, Keeney Publishing Co., Inc., Chicago, 1938; Air Conditioning in Summer and Winter, by Richard E. Holmes, McGraw Hill Book Co., Inc., New York, 1938; Air Conditioning by Charles E. Fuller and David Snow, The Norman W. Henley Publishing Co., New York, 1938; Heating, Ventilating and Air Conditioning Fundamentals by William H. Severns, John Wiley & Sons, Ltd., New York, 1937; Heating and Air Conditioning of Buildings by Oscar Faber and J. R. Kell, The Architectural Press, London, England, 1936.

NOISE IN BUILDINGS

From Joint D. & R. Subcommittee Survey—New York Data	Noise Level	Data From Other Sources	Source
	100		
		Boiler Factory	1
Subway—Local station with Express passing	95		
	90		
	85	Some factories are as high as this	2
	80	Very loud radio music in home	4
	75		
Noisiest non-residential Bldg. Location measured	70	Stenographic room	3
Average of 6 factory locations		Very noisy restaurant	4
	65		
	60		
Information booth in large railway station		Noisy office or department store	1
Average non-residential location	55		
	50	Moderate restaurant clatter	4
		Few places where people work are	2
Noisiest residence measured	45	Average office below this	1
	40	Very quiet radio in home	4
		Quiet office	1
Quietest non-residential location measured	35	Soft radio music in apartment	3
Average residence	30		
		Country residence	1
	25	County Court, Chicago, room empty, windows closed	2
Quietest residence measured	20	Quiet garden, London	4

SOURCES:
1. H. Fletcher, "Speech and Hearing," p. 187. Marginal Audibility Method with 3A audiometer and offset receiver. 17 Db. added as approximate figure to convert to noise level.
2. D. A. Laird, Scientific American, Dec. 1928, p. 509. Balance Method with 3A audiometer and receiver with flat cap. Approximately equal to noise level.
3. W. Waterfall, Engineering News Record, Jan. 10, 1927, p. 60. Same method as (2) above.
4. A. M. Davis, Nature, Jan. 11, 1930, p. 48. Balance or marginal audibility method with 640-cycle tuning-fork. Figures given in terms of sensation level, estimated equal to noise level.

From "City Noise", courtesy New York City Department of Health.

SOUND IS vibrational energy identified as to pitch by frequency of vibration (cycles) and as to loudness by intensities—the amount of vibrational energy transmitted per second per cycle—measured in decibels.

Noise is a combination of sounds, each of which may vary in pitch and intensity, and depending upon character and volume may be unnoticed by, or irritating to, office workers.

Effect of noise on people

Human reactions to noise have not yet been completely charted. Tests at Northwestern University and at Bellevue Hospital in New York have shown that noise changes pulse and breathing rates, increases blood pressure, causes bodily fatigue and a lowering of efficiency. Other tests showed "an increase of about 9 per cent in overall efficiency as measured by the output per worker-hour resulting from a reduction of about 6 decibels in the general noise level" (Sabine).

Such tests, however, give no conclusive facts regarding the type and character of *noise* most irritating to the average office worker. Acoustical engineers hold various opinions as a result of experience. Most, however, think that high pitched and intermittent *sounds* are more generally annoying. Constant *noise* seems most disturbing to average office workers. (Pearce). Nearby inside noise is thought to be most irritating.

Acoustical "Comfort Zone"

Individuals differ as to their ability to tolerate noise without annoyance and as to the extent of mental and nervous accommodation to noisy conditions. There exists, also, a wide variety in the character of noise to which office workers are subjected.

Because of such variations, few scientific data are available which define limits of acoustic comfort for office workers. The matter is further complicated by the fact that a constant noise lessens the *apparent* intensity of individual sounds that might otherwise be loud to the point of annoyance. Therefore an acoustical "comfort zone"—limits of easily-tolerated pitch and intensity requiring a practical minimum of individual accommodation—can be stated only in terms of engineering opinion and experience.

Satisfactory pitches (those that are apparently least generally annoying) depend to a great extent upon intensity or loudness, but range practically between 256 and 2048 cycles. Given extremes of pitch, a room can be relatively quiet but still annoying.

Intensities can be marked only by average or upper limits relative to an average of the pitches noted above.

Following are averages of engineering opinion relative to satisfactory noise levels in various types of office spaces. The range indicates upper limits only.

Executive offices: Below 45 decibels. With a noise level of 25 to 40 decibels "comfort conditions for work would be considered ideal" (Pearce). Recommendations ranged from 40 to 55 decibels.
Secretarial and Reception spaces: Below 50 decibels. Recommendations ranged from 40 to 60 decibels.
Switchboard operating areas: Below 55 decibels. Recommendations ranged from 35 to 70 decibels.
General office space for typing, operating, clerical & accounting machines, etc.: Below 65 decibels. Recommendations ranged from 50 to 75 decibels.

These figures are regarded as reasonable standards commercially attainable. Preferred noise levels would be from 10 to 15 decibels lower in each case. In general the less noise present, the better working conditions become (Parkinson).

Methods of controlling sound

Construction to exclude noises outside the building involves a relatively massive structure (sound transmission in general is proportional to the mass of the transmitting substance) fixed windows, double membrane windows or the omission of all windows as the most effective means currently known.

Vibrations from machinery can be damped through use of resilient devices and materials. Choice of a particular type involves analysis of frequencies and intensities of the sounds to be isolated and usually calls for services of an acoustical engineer.

In air-conditioning systems flexible connections between ducts and blower units will damp vibration. Noise of fans, air-borne through supply ducts, can be practically eliminated by lining the room end with sound-absorbent material for an area approximately ten times the average opening.

Equipment and structure-borne noises may be annoying in a quiet office and not noticeable in general working areas. They will be completely masked if reduced to a loudness 5 decibels less than the average noise levels of spaces under consideration.

Noise generated in a room can be reduced by sound absorbing materials, usually applied to ceilings, rarely—in severe cases—to walls. A maximum reduction of 10 decibels can be obtained by this means—about a 50% loudness reduction judged by ear.

Selection of such material depends upon its appearance, ease of maintenance, etc., as well as its sound-absorbing efficiency. Rating should be the average value of co-efficients from 256 to 2048 cycles.

References:

The foregoing material was compiled from information furnished by Paul E. Sabine, Riverbank Laboratories; John S. Parkinson, Johns-Manville; S. P. Walker, United States Gypsum Co.; L. S. Ayars, Jr., The Celotex Corporation; Allen E. Pearce, Armstrong Cork Products Co., and various published sources including the Journal of the Acoustical Society of America, Circulars of the National Bureau of Standards, and "City Noise," Report of the New York City Noise Abatement Commission.

OFFICE LIGHTING

Courtesy Westinghouse

Semi-indirect fixtures 9 ft. on centers, bookkeeping department, Crocker First National Bank, San Francisco

LIGHTING METHODS

General illumination

All types of areas require some degree of general illumination. Recommendations as to quantity within each area vary, one consultant suggesting the use of approximately 3 footcandles of general illumination for most office building spaces (supplemented by local lighting); others range from 5 to 10 or 20 footcandles.

Local illumination

This can be supplied by portions of installed lighting systems by increasing wattages locally, by using portable fixtures, or by equipping machines or desks with individual lighting units. The first method may overload wiring systems; the second and third are commonly used. Local illumination is seldom, if ever, recommended as the only source of light; general lighting should supplement it to avoid excessive eyestrain and consequent fatigue.

Proportions of local to general lighting are variously recommended as 5 to 1 (General Electric Co.), 100 to 1 (Sweet), and other ratios between. Mr. Sweet foresees the eventual use, to a very great degree, of local lighting in office buildings, as knowledge and appreciation increases of material benefits to be obtained from, and flexibility desirable in, lighting systems.

Recommendations as to methods of supplying both types of lighting also vary. The General Electric Co. states that: "Illumination values up to 50 footcandles can be obtained from a general lighting system. For those tasks requiring more than 50 footcandles it will be found more economical to provide a combination of general lighting plus supplementary."(1)

LIGHTING CHARACTERISTICS

Attributes of lighting quality have been defined as: (a) *intensity;* (b) *uniformity;* (c) *exposed brightness;* (d) *direction;* (e) *distribution of brightness.* Similar terms such as "glare," which may be the result of exposed or reflected brightness, and "diffusion" are used by many authorities.

Intensity

Recommendations for intensities for various types of work have been made by several authorities, some based on laboratory tests, some on practical experience. These are tabulated on the following page. A wide range will be noted in some instances; this is due partly to variable conditions covered by the general classifications listed. Exact limits are difficult to assign since intensities are in all cases relative. Many factors affect the subject besides the number of footcandles delivered.

The psychological effect of increased intensities has been stated by some authorities to be an increase in cheerfulness, mental perception, expenditure of nervous energy, etc. However, Arthur J. Sweet, consulting engineer,

(1) "Lighting for Seeing in the Office," General Elec. Co., Cleveland, Ohio.

The Editors wish to acknowledge help from the following sources: Thos. A. Carter (Curtis Lighting, Inc.); A. L. Powell, J. L. Tugman, F. O. Urban (General Electric Co.); W. H. Kahler (Westinghouse Elec. & Mfg. Co.); H. L. Logan (Holophane Co., Inc.); F. E. Guth (Edwin F. Guth Co.); Henry H. Dean (George Ainsworth); Arthur J. Wilde (Pittsburgh Reflector Co.); Stanley McCandless, consulting engineer; Arthur J. Sweet, consulting engineer.

Courtesy General Electric

Direct lighting units, with direction and diffusion control; Nela Park branch, Cleveland Trust Company.

Courtesy Westinghouse

Semi-indirect units here furnish 30 footcandles at desks; Crocker First National Bank, San Francisco, Calif.

Courtesy Westinghouse

Totally indirect units in the Remington-Rand Building, Chicago, Ill.

LIGHTING INTENSITIES IN FOOTCANDLES

Type of Work or Space	Range	Type of Work or Space	Range
Lobby—public	3-15***	Filing	10- 30*
Lobby—elev.	5-15	Bookkeeping	20- 50*
Corridors, stairs	3- 5	Accounting machines	20-100*
Reception	5-20**	Sorting	10- 50*
General office	10-30**	Addressing	10- 30*
Reception	10	Drafting	30- 50*
Switchboard	10-30	Vault	5- 10
Executive	15-50*	Stores, janitor	5
Secretary	15-50*	Toilets	5
Typing	25-50		

* Wide range due to inclusion by 1 consultant of age factor, or to consideration of more difficult types of visual tasks—*see text.*
** Several consultants recommend for general office spaces and particularly reception rooms the use of comparatively low general intensities and high intensity local lighting—*see text.*
*** Wide range due to consideration of display or decorative lighting.

suggests that high general intensities may result in lack of concentration and consequent inefficiency in offices. He recommends, "for areas where close visual work is seldom or never performed, relatively low intensities"; and for general areas where exacting work is more or less frequently performed, general illumination of about 3 footcandles, plus properly designed local illumination. There are two difficulties: Portable fixtures, etc. are usually tenant-supplied, and the average tenant recognizes neither good lighting standards nor their value; and provision of sufficient outlets to permit good local lighting is difficult. A reasonable recommendation would seem to be provision for both high intensity general lighting and a multiplicity of outlets for portable fixtures.

Few persons or organizations consulted reported consideration of natural lighting (source or amount) as affecting artificial lighting recommendations. Mr. Sweet states, "Where artificial lighting is used to supplement daylight (the usual case in offices), intensities should be double those adequate where artificial lighting is exclusively employed. This arises because the day-adapted eye is less sensitive to light stimuli than night-adapted eye."

Desirability of flexible installations to meet the requirements of workers of varying ages was emphasized by H. L. Logan, consulting with the Holophane Company. He calls attention to the fact that light intensity recommendations generally apply to young workers, and as workers age, "the amount of light required for a visual task increases, slowly at first but swiftly in upper brackets." Consequently, his recommendations for executives' offices are high. "Middle aged men need on the average five times as much light . . . as men in their twenties."

Uniformity

Absence of "spotty" installations, in which light sources are unduly obtrusive against their backgrounds, is generally considered desirable. Several opinions recommend moderately high levels of general illumination, coupled with judicious choice of fixtures and location, as the means for avoiding this defect. On the other hand, Mr. Sweet says: "Where (as in corridors or in general offices where no local lighting is employed) a like intensity may be required at any and all points, uniformity of lighting makes for low operating costs and should therefore be aproximated. Where . . . close visual work is . . . (permanently) associated with particular locations, non-uniformity of proper character becomes a positive virtue . . ."

Exposed brightness

High exposed brightnesses are universally termed undesirable except for display or "festive" lighting and then only if not extreme. Direct glare is the usual result, with consequent fatigue and inefficiency of the workers.

Direction

Certain types of spaces demand direct lighting; precautions taken to control direction and diffusion of direct light result in high efficiency and absence of surface reflections, glare, etc. Means employed to avoid high brightness toward the floor generally result in lighting by reflection from ceilings or by extended "architectural" sources, panels, etc. These should diffuse light

SPACING OF LIGHTING OUTLETS

Ceiling Height (Or Height in the Clear) (Feet)	Between Outlets		Between Outside Outlets and Wall		Approx. Area Per Outlet (Sq. Ft.)
	Usual (Feet)	Max. (Units at Ceiling) Not more than*	Aisles, Storage	Desks Not more than*	
9	8	8	Usually one-half actual spacing between units	3	60- 70
10	9	9		3½	70- 85
11	10	10½		3½	85-100
12	10-12	12		3½-4	100-150

* For totally indirect lighting, maximum between units may be increased approximately 2 ft.; between units and wall, 1 ft. From "Lighting for Seeing in the Office", General Electric Co.

sufficiently to avoid objectionable shadows and high brightness (or "glare"). Portable fixtures, producing local lighting satisfactory for particular tasks, may throw strong shadows which, if properly controlled, may be rendered harmless.

Research by the Illuminating Engineering Society tended to show that: "Reading tasks, placed flat on a desk, seem to be more visible under unidirectional (controlled direct) lighting than under the indirect lighting; that, for all seeing tasks considered, lower levels of unidirectional illumination are required than of indirect (76%); that visibility (of such tasks) is materially higher per footcandle when lighted by unidirectional lighting from over the left shoulder as compared to diffuse illumination from an indirect system."(2)

Importance of avoiding high brightness and providing proper direction respecting both the eye and the object viewed "preclude use of direct lighting in working areas unless, (1) points at which work will be performed can be definitely established, (2) direct sources are of a size approximating 1/4 floor area, certainly not smaller than 1/10 floor area" (Sweet).

Distribution of brightness

Psychological effects as well as physical are here important, as noted under *"Intensity"* and *"Exposed brightness."* In addition . . . "Where the ceiling of a small office is very much brighter than lower walls or objects in the normal field of vision, a strong unpleasant sense of being in a pit . . . " may be produced. "Such lighting . . . tends to make the room seem smaller, the ceiling higher . . . " (Sweet).

Natural inside lighting falls off rapidly as distance from windows increases, in some instances dropping from 100 footcandles to 5 in a distance of 20 ft. One means of overcoming this is to provide separate controls for lights, using those farthest from natural light sources more constantly than those close. Photo-electrically operated automatic controls are also available.

EQUIPMENT

Types of fixtures vary according to the manner in which they distribute light. Brief descriptions of the main classifications are given in the accompanying tabulation. Those usually recommended for general illumination and for special effects include semi-indirect and totally indirect types. For local lighting, semi-direct and semi-indirect fixtures are commonly used, as well as direct types. Means of determining desirability of specific types may be found under "Lighting Characteristics."

TYPES OF FIXTURES OR SYSTEMS

Direct fixtures concentrate all or most of their light downward. Kinds of fixtures range from factory-type reflectors, to fixtures of large area, such as enclosing globes, panels, etc. High-brightness direct fixtures generally produce fatigue; controls such as diffusing glass, lenses, etc., minimize this defect. One consultant recommends highly the use of direct fixtures whose light can be controlled as to direction by louvers, shades, etc. Nearly all recommend concealing the light source.

Semi-direct systems comprise those where predominant light on working surfaces comes direct from the lighting units, but where considerable light comes also from reflection. Typical fixture has white glass enclosing globe.

Semi-indirect lighting supplies some light directly, but the major portion is transmitted indirectly. Fixtures generally have translucent lower portion of shade or globe, transparent (or omitted) upper portion. Correctly designed semi-indirect fixtures eliminate glare.

Indirect lighting supplies all working light by reflection from ceilings and upper portions of walls. Sources may range from simple pendant fixtures to elaborate built-in units, provided no light is transmitted directly downward. Wattage required is usually greater than for other types; source is always concealed; glare usually eliminated.

TYPES OF LAMPS

While tungsten lamps are at present the predominant type, others are being developed, of which two kinds seem to be suitable for offices.

Forms of Mercury lamps supply a close approximation of daylight and are used together with tungsten lamps. Installation costs are at present high, since special transformers are required; operating costs are somewhat lower; replacement cost per lamp is high. Fixtures are available for combinations of mercury and tungsten lamps.

Mazda fluorescent lamps are available for supplying a wide range of colors in light, but here again, the "daylight" type, or those which emit a bluish light, seem most applicable to office buildings. These are similar in shape to "Lumiline" lamps but require special equipment and wiring. A 15-w., 18-in. white fluorescent lamp is approximately equivalent to a 40-w. regular or 60-w. "Lumiline" lamp.

Use of "Polaroid" glass in fixtures is at present limited to a few portable types. Use of these will eliminate reflected glare from high intensity direct local sources; this effect is most noticeable when light rays strike and are reflected from a surface at approximately 35° angles.

(2) "Visibility of Various Reading Tasks Under Combinations of Diffuse and Unidirectional Lighting," report by Brown, Robinson (Stanford Univ.) and Glenni (General Electric Co.) Illuminating Eng. Soc.

COLOR FOR INTERIORS
A Guide to Color Selection — TIME-SAVER STANDARDS

RESEARCH on the mechanics of producing colors, also the classification and standardization of color samples has been extensive. But *use* of color is not yet a science. Research has produced comparatively few facts indicating the effect of color on human beings that can be generally applied to meet a scientific standard of environment.

Psychological aspects

Experience has shown that men prefer cool colors, women warm ones. Warm colors generally stimulate; cool ones produce a quieting effect. Also, colors seem actually to enhance sensations of temperature (Birren).

Various tests, though not conclusive, show other reactions to color. Birren states: "Under influence of red, time is overestimated, weights seem relatively heavier. Under influence of green, conditions are reversed." Experiments on students showed the following effects of colors (From "National Safety News," March, 1937): *Black:* Melancholia. Decreased work. *Red:* Temporary stimulation followed by recreation, nervousness, and headache. *Blue:* Calmness and seriousness. *Green:* Increased vitality, happiness. *Yellow:* Increased vitality, amiability. Yellow is conducive to greatest mental efficiency. Green has therapeutic worth in combatting nervous irritation (Ketcham).

Relatively large areas of strong colors repel. Grayed or partially neutralized shades are relatively less tiring and least so if accompanied or "accented" with small areas of contrast.

Dark shades produce underestimation of space; light colors the opposite. Also, assuming proper interior lighting, deep tones tend to enhance concentration, light tones to dissipate attention. Light, clean tints of any color promote neatness (Hookway). In general, colors with high reflectivities—light blue, green, gray-blue, green-yellow, buff, etc.—are conducive to a sense of cheerful well-being and stability in people. The reds, dark browns, dark blues, etc.—colors with low reflectivities that require high lighting intensities for equivalent illumination levels—have adverse effects. (Ketcham)

Physical aspects

Reflection values for flat paint colors based upon a comparison with magnesium carbonate as the standard of reflection at 98 per cent are:

COLOR	VALUE
White	84.0
Cream	70.4
Light pink	69.4
Ivory	64.3
Yellow	60.5
Flesh	56.0
Buff	55.4
Light green	54.1
Light gray	53.6
Light blue	45.5
Aluminum gray	41.9
Sage green	41.0
Brown	23.6
Dark red	14.4
Dark green	9.8
Dark blue	9.3
Black	2.9

Readings made by the Munsell Color Co., Inc., for the New Jersey Zinc Co.

Black absorbs heat, light, and sound, and white is the opposite in all respects. White, however, as the strongest of all colors, can cause aberration in the eye; and all strong light-reflecting colors tend to tire the eyes and cause a physical and nervous strain.

Color effects are dependent not only on the type, shade, and extent of color, but also on location of color areas, the relative positions of contrasting colors, and the quantity and quality of illumination employed. In addition, tints, or mixtures, of colors can be adjusted to provide a 10 to 15 percent variation in light reflecting value without materially affecting visual character.

Reflection values are also influenced by the type of light used. Westinghouse lighting engineers tested 21 color specimens and found that the co-efficient of reflection under ordinary Mazda illumination is about 2 percent less than under illumination from a mercury vapor lamp.

Color application

Colors that are too warm or too cool will lower efficiencies of office workers. A light green midway between yellow and blue is considered the best all-season color for any exposure and probably the best color for general office space (Hookway). Blue is too cool a color for high efficiency.

For office interiors with indirect, semi-indirect lighting fixtures, or direct lights from large panels, a reflection value of 80 to 85 percent (white) is regarded as desirable for ceilings; from 50 to 60 percent is generally adequate for walls. Light wall colors tend to enlarge spaces, make detail subordinate. Deeper wall colors enhance visual efficiency as to details. (Birren).

The following table gives color schemes suggested by Howard Ketcham, color engineer, for private offices.

	WALL	LIGHT REFLECTION %	RUG	UPHOLSTERY	CURTAIN
A.	Very Pale or Pale Gray	73	Cedar or Mulberry	Old Red	Old Red
B.	Faint Buff	71.5	Deep Adam's Green	Pigskin (light tan)	Medium Adam's Green
C.	Pale Buff	65	Rust	Deep Adam's Green	Rust — Lighter value than rug
D.	Yellow Pale Green-	64.5	Pure hue of Green (no yellow or blue content)	Pigskin (light tan)	Combining 2 greens already used and beige
E.	Faint, Gray Blue-Green	69	Deep Gobelin Brown	Brown or Reddish Brown	Tan
F.	Pale Gray Blue	65	Delft Blue	Reddish hue of Brown	Reddish hue of tan

References:

The foregoing information has been compiled from a number of sources, including: Howard Ketcham, Color Engineer; Faber Birren; Dr. Forrest Lee Dimmick of Hobart College Psychology Laboratory; Raymond H. Hookway of The Sherwin-Williams Co.; Allen J. Burdette; and S. G. Hibben, Westinghouse Electric and Manufacturing Co.

Bibliography:

A Dictionary of Color, by A. Maery and M. Rea Paul; McGraw-Hill Book Co., Inc., New York. Contains approximately 7,000 different color samples arranged for use as practical color standards.

Munsell Book of Color, by The Munsell Color Co., Baltimore, Md., 1929. Standard and abridged editions, each containing approximately 400 different color samples, each identified as to hue, lightness, and saturation, according to the Munsell system of color nomenclature.

Color and Design in the Decorative Arts, by Elizabeth Burris-Meyer, Prentice Hall, New York, 1933.

Functional Color, by Faber Birren. The Crimson Press, New York, 1937.

Courtesy Johns-Manville

Design Elements that Affect Rentability

Because the building manager has special knowledge of tenant needs and preferences, he is particularly able to discuss elements of construction and equipment that may add to or decrease the earnings of a modern office building. This report, developed by Norbert Brown, Editor of the Real Estate Record, in collaboration with Robert F. Marshall, Managing Editor of the same publication, represents an expression of professional building management. Statements may not be applicable in all cases; and care has been exercised to divorce expressed opinions from application to unusual situations. . . . Acknowledgment is given for valuable assistance in preparation of this report to the following building management executives, but readers are cautioned not to ascribe specific assertions to any one person: Jeremiah K. Cronin, manager, Mortgage and Real Estate Department, Bankers Trust Company, New York; Herbert A. Fisher, manager, Fisher Building Division, Fisher & Company, Inc., Detroit; W. E. Malm, president, Wm. E. Malm & Co., Cleveland; Fred B. Moore, manager, Rhodes-Haverty Investment Co., Atlanta; and E. J. Smith, operating manager, Sixty Wall Tower, Inc., New York.

General observations

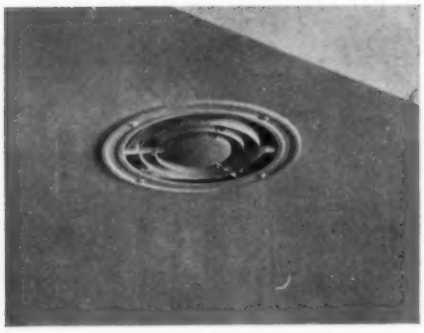
CHANGING DESIGN fashions and technical advances tend to hasten obsolescence in many parts of the building. Among the items especially subject to these influences are lighting fixtures, elevators, air-conditioning equipment, and wall finishes. Building managers as a group are strongly opposed to designs embodying garish effects or extreme styles.

Lighting that draws attention to the location is considered a prime factor in the design of the ground floor. There is a trend toward giving storefronts a full story's height to permit maximum display of the tenant's name. Another growing practice is that of placing the entrance at the side of the storefront rather than in the middle in order to provide more display space. There should be no steps, either up or down, at the store entrance, and columns should be as small as possible in the interest of greater window area. A freight entrance is recommended at rear or through basement. Good ventilation, with provisions for air conditioning, is considered essential.

On the first floor of the building, and possibly in part of the basement, there should be at least enough service shops to meet the needs of tenants. Conference rooms, law libraries, and similar facilities for use of tenants are desirable. Few managers think recreational space is necessary for tenants.

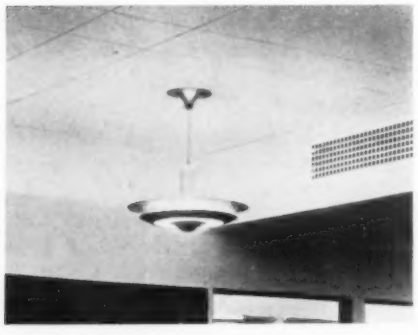
There is a long list of equipment, some of it essential, which managers consider costly to maintain, including double-hung, non-reversible windows; wood and travertine floors; fixtures of highly polished bronze, aluminum, and the so-called stainless metals; fully automatic elevators; self-contained radiator valves; highly polished wood paneling; porous stone, either exterior or interior; veneered elevator cabs; venetian blinds with taped wood slats; totally and semi-indirect lighting fixtures of the open type; flat and semi-gloss wall and ceiling finishes; prismatic glass; steel sash; floor covering in elevator cabs; collapsible elevator gates and doors, and elevator guide rails. One manager, contending that both marble and terrazzo floors are expensive to maintain, says that the ideal floor for the entire building is concrete slab covered with ¼-inch battleship linoleum.

From the manager's point of view, some of the most troublesome elements of building design are improper relation between window area and floor area, bays of incorrect size, penthouses that are too small, excess radiation, insufficient capacity in the electrical system, wrongly designed elevator shafts, lack of zoning or improper zoning of the heating system, exposed steam risers, insufficient space for ma-

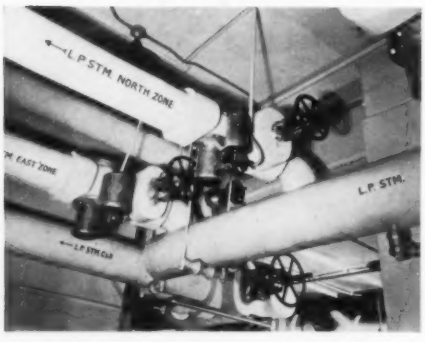


Air conditioning is an aid to renting; the type of system a matter of controversy.

Acoustic control is generally endorsed; necessary on lower floors, desirable elsewhere.



Good lighting is essential; concealed light sources, intensities from 10 to 20 footcandles.



Steam and power can be purchased; the private plant may soon be a thing of the past.

chinery, deficient toilet facilities in the basement, and inadequate and badly located janitors' closets, employees' locker rooms, and workshops.

There also are certain pieces of building equipment that are likely to depreciate rapidly with use, such as steam return lines carrying steam with a high CO_2 content, and hot-water lines. It usually is regarded as poor economy to use materials for pipe and flashing that are locally subject to corrosion and otherwise to sacrifice durability for a small initial saving. One manager stresses the need for constructing mortar joints in exterior walls so that they are watertight, as follows: "Ninety per cent of the buildings erected since 1927 have had to spend substantial sums of money because of outside walls leaking and ruining the plaster."

Renting aids

Among the structural and mechanical features which stand highest in the estimation of managers as renting aids are high-speed elevators, properly proportioned bays, conveniently situated and amply large washrooms, soundproofed walls and ceilings, adequate plumbing and electrical connections, floors finished so that they are ready for use, indirect lighting, concealed radiation, air conditioning, efficient natural and artificial lighting, and good ventilation, possibly with window ventilators supplying filtered air.

Maintenance aids

Equipment recommended for lower operating and maintenance costs includes static condensers for electric current to increase the power factor credit, zone controls on steam risers, modern tool shops for electricians and mechanics, and modern scrubbing and cleaning machines. Among the suggested shop equipment are electrically operated pipe-cutting and threading devices, portable electric drills, welding tools, and portable paint sprayers.

Parking facilities

Parking facilities in connection with the building, and preferably in the basement, add to the rentability of both store and office space.

Lobbies

The lobby of the building should be impressive in design, but in no sense gaudy. At the same time, it should be cheerful and businesslike. Marble and bronze still are favored materials. There is great emphasis on service facilities, despite some disagreement as to what should be included. Some managers, for example, approve cigar and news stands in the lobby proper. Others, believing them undignified, contend that they should be included in the provisions for service shops such as lunch rooms, telegraph offices, drugstores, and haberdasheries. Among the indispensable items are directory boards and, in large buildings, information desks. Both should be near, but not in front of, the elevators. One manager suggests that a large clock be mounted over the information desk. Another cautions that if this is done the clock must be worked into the general design of the lobby. Few managers encourage installation of vending machines or drinking fountains.

The modern building manager wants a functional rather than a monumental lobby, one that is large enough to accommodate traffic in peak periods but not large enough to foster loitering. It also is felt that a large empty lobby gives the impression that the building has few tenants, which leads to a suspicion that something is wrong with the offices. Adequate lighting is particularly important in the lobby.

It is recommended that elevator banks face one another, that there be a double bank of building entrance doors with heat introduced between them in winter, and that a recessed storm mat be installed.

Rentable areas

It is commonly thought that net rentable area should represent from 70 to 85 per cent of the gross area, depending on the height of the structure. The higher the building, the lower the net rentable area per foot of gross area. A gauge of planning skill is the general rule that every twenty to twenty-two rule that every 20 to 22 cu. ft. of construction should produce one square foot of rentable area.

Elevators

Elevators, like other utilities, should be as near the center of the building as the structure's size and shape permit, and convenient to the main entrance. At the same time, the location should be adjacent to the flow of traffic but not at a point where elevator traffic will cross traffic to other portions of the building, such as a bank or interior shops on the ground floor. Recommended speeds range from 400 ft. per minute for local service to 1,200 ft. per minute for express cars. The

following schedule might be taken as a median of current requirements: local service to the fifteenth floor, 600 F.P.M.; express service above the fifteenth floor, 700 F.P.M.; tower service, 800 F.P.M. Service is considered excellent at intervals of 30 seconds, good at 35 seconds, fair at 40 seconds, and unsatisfactory at longer intervals.

It is suggested that elevator capacity be calculated on the basis of 25,000 sq. ft. of gross area per car, and a building population of one person for each 100 sq. ft. of gross area. Another proposal is that one passenger elevator be provided for each 20,000 sq. ft. of rentable area. These rules of thumb are, of course, subject to revision in actual application. One manager makes the specific recommendation that a twenty-story building with a gross area of 100,000 sq. ft. and a population of 800 persons be equipped with four elevators traveling 700 F.P.M., each capable of carrying twenty passengers.

Managers seem to agree that elevators should accommodate fifteen to eighteen persons, that all cars should serve the basement, and that they should be arranged in banks of four or five units. In general, it is felt that the total capacity should be sufficient to empty the building in thirty minutes.

The gearless traction, variable voltage, self-leveling type of elevator with automatic signal control is considered the most efficient. With such features as "selective automatic control" and full "quota control", such installations approximate the present ideal. There are instances in which cost restrictions rule out equipment with these refinements, but in any case the installation should include flash lanterns with gongs at each landing, synchronized with flash signals in the cabs. In larger installations, an automatic or manual dispatching system, with a position indicator in the lobby, should be provided. It also is recommended that a position indicator, either mechanical or illuminated, be installed above the entrance to each car at the ground floor.

Freight entrances

The freight entrance should be at the rear of the building, facing a wide alley or receiving lot if possible. In any event, it should be off the principal thoroughfare in a location where traffic congestion and handling of freight will be at a minimum. A basement receiving room with a ramp approach is one solution. The location of the freight entrance should not be considered in terms of convenience to passenger elevators. Special freight elevators should be provided.

Bays

The 18 x 24 ft. bay, with some variations permissible in both dimensions, is considered the most efficient unit of rentable space. A T-shaped partition divides the 18 ft. width into two 8 ft. 9 in. offices—an arrangement which, with a reception room on the corridor, usually commands the maximum squarefoot rental. A bay less than 17 ft. wide cannot be divided satisfactorily in this fashion. The latitude allowable in modifying the 18 x 24 ft. bay is indicated by these specific recommendations as to size: 18 ft. 6 in. x 22 ft., 20 x 22 ft., and 17 ft. 6 in. x 20 ft. to 25 ft. All of this applies to outside bays. Inside bays should be of a size which permits symmetrical and efficient arrangement of lighting fixtures.

Windows

Two 4 x 7 ft. windows in an 18 x 24 ft. bay constitute the most desirable arrangement. The window height may be varied slightly either way, but the 4 ft. width usually is regarded as the minimum. One manager contends that the area of glass exposed to the weather should amount to about 7 per cent of the total floor area. Another points out that under the widely used Sheridan-Karkow formula for pricing office space, rent is directly affected by relation of window area to floor area. Within practical limits, the greater the window area, the higher the rent.

Partitions

As a precaution, it is urged that not over 50 per cent of the dividing partitions be installed in a new building, and except for display purposes, no T-shaped partitions be erected until the space is rented. One manager suggests temporary partitions for large tenants, and permanent partitions for small offices and professional quarters. Of course, permanent partitions are necessary between suites. Among the permanent partitions recommended are hollow tile and plaster, gypsum block and plaster, and glass block. Because of the relatively low cost of the first two and the flexibility of the last, they also can be employed as temporary partitions. The usual alternatives where clear glass is needed are wood and steel sectional partitions. Building codes and insurance regulations restrict use of the latter in some cities.

Corridors

Preference as to corridor width varies considerably, but the 6-ft. corridor has gained general acceptance. One manager who recommends this size for secondary or extension corridors specifies 8 ft. for elevator corridors. Another suggests 6 to 15 ft. for main corridors and 5 to 8 ft. for secondary corridors. Still another believes that corridors more than 100 ft. long should be 5 ft. wide, with a width of 4 ft. in shorter corridors. Ceiling height is one of the governing factors, for lower ceilings require wider corridors.

Floors

Marble, terrazzo, and rubber tile are the most popular materials for corridor floors, with no preponderant preference for any one of the three. A 5-ft. marble wainscot set on a dark base is recommended for the walls, with smooth plaster on the upper walls and ceilings. The treatment of toilets and washrooms should be much the same, with the possible exceptions of higher wainscoting and the substitution of ceramic tile for marble walls and floors. Stall dividers should be of a non-absorbent material such as marble.

Toilet rooms

It is held generally that toilet rooms should be as near the center of the building as possible. However, this is somewhat contingent on the cost of adequate ventilation. A central location is especially feasible where the necessary ducts can be combined with ducts serving other space. If outside space must be used for toilets—and there are some managers who believe that light, airy toilets are a renting aid—they should be adjacent to or at least near other service space. In addition, they should be on the north side of the building so that the more desirable exposures will not be sacrificed.

The inside "L" spaces in buildings with two or more wings are considered good toilet locations. Although both the location and number of toilets are dependent on the size and shape of the building, most managers believe that there should be toilet rooms for both men and women on each floor. It is suggested, as a general rule, that for every 30,000 sq. ft. of office space, the following facilities be provided: ten toilets, four urinals, and two lavatories for men; and nine toilets and two lavatories for women. With central toilets, there should be at least one urinal on each floor.

Workshops and storerooms

Architects sometimes are criticized for failing to provide enough space for workshops and rooms for storing partitions, lumber, and other bulky supplies. The basement is the preferred location for workshops. In a building with a bank on the ground floor, they can be located on the truss floor. They should be grouped, rather than scattered through the basement, and properly ventilated.

Waste paper storage

Storage rooms for waste paper should be fireproof and large enough to handle a 24-hour accumulation. A basement location convenient to the freight entrance is best. Installation of sprinklers and a steam line controlled from the outside is recommended for fire protection.

Ash hoists and incinerators

Fewer ash hoists and incinerators are installed today than formerly. There is no need of an ash hoist in a building using purchased steam, or oil, or natural gas as fuel. Instead of operating an incinerator, many managers have waste removed. Where an incinerator is needed, a 3 x 6 ft. firebox is recommended for buildings with less than 200,000 sq. ft. of floor area. In larger buildings, the size of the firebox should be increased in proportion. It is suggested that the incinerator be equipped with a pipe coil connected to the hot-water lines, adding to the capacity of the hot-water system.

Pipe shafts

Pipe shafts should be of sufficient size to allow easy access to all lines for inspection and repair, and there should be access panels on all floors. In particular, cut-off valves and similar devices should be readily accessible. It is conceded to be impractical to attempt such provisions in the case of pipe and conduits that are concealed in floors, walls, and ceilings. However, trouble in these lines is rare, and heating risers and conduits usually last the life of the building. There is no way to avoid tearing out plaster when plumbing lines must be replaced.

Floor loads

There is some demand for larger floor loading capacities. Recommendations range roughly from 100 to 200 pounds per sq. ft., 150 pounds ordinarily being considered ample. A 10-ft. ceiling height in the clear, which permits use of high shelves and cabinets, allows installation of ducts for air conditioning, and makes for efficient lighting and ventilating, is regarded as ideal. In general, ceilings are higher in the South than in the North.

Boiler plants

Few managers believe it is necessary to reserve space for private boiler plants in buildings using purchased steam and power. One goes so far as to call the private plant a thing of the past. Another points out that in a tall building the stack would usurp too much rentable area, while in a large low building this might not be the case.

Air conditioning

Some managers believe that the designer of a building need make no special provision for air conditioning in the office space itself. They maintain that unit conditioners can be installed with little inconvenience to either tenants or management. In the case of large lower-floor tenants who contract for specific space in advance of construction, it is suggested that ventilating equipment adaptable to air conditioning be supplied.

There are other managers, however, who believe that definite provisions should be made for air conditioning when a building is planned. They offer a variety of recommendations: ventilating ducts arranged so that they can be used for sectional air conditioning; base plugs in exterior walls for connecting individual units; waste and water lines in the wall at the window side of the units (not necessary for conditioners of the evaporative condenser type); a 220-volt three-phase line on every floor into which unit conditioners can be plugged; doors designed for easy installation of return ventilators, and general provisions for concealment of ductwork.

Cleaning systems

Opinion is divided as to the advisability of installing a central vacuum cleaning system, but managers of buildings so equipped assert that the central system is more economical than portable equipment. With the former, vacuum outlets at every second column are recommended. Where portable cleaners and scrubbing machines are to be used, electrical outlets must be provided in the corridors. There should be a janitors' closet on each floor containing a slop sink, preferably at floor level to facilitate dumping of portable scrubbing tanks. The closet should be large enough to hold cleaning machines and janitors' supplies.

Wiring and plumbing systems

Wiring and plumbing systems should anticipate increases in demand, with pipe shafts and conduits allowing for expansion by as much as 100 percent. Wiring in feeder and room distribution systems should provide for 50 percent more than the capacity of the initial installation. Further recommendations: a plumbing outlet on every other column; one electrical outlet on each face of interior columns, and one on each outside column; one fan outlet and a power outlet for an air-conditioning unit in each bay; under-floor ducts on 5-ft. centers; additional outlets for telephones, desk lamps, clocks, office machines, and other equipment if under-floor ducts are not installed.

Illumination

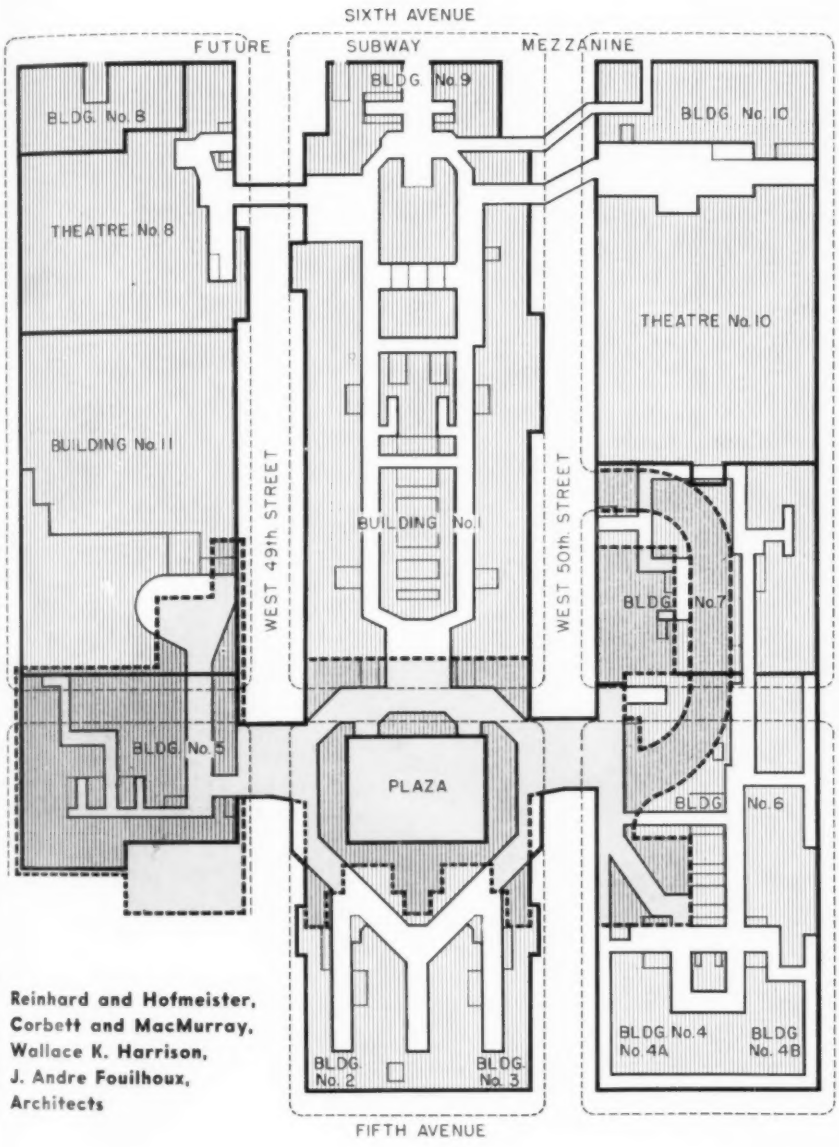
Semi-indirect illumination with an intensity of ten to twelve footcandles ordinarily is considered adequate in office space. One manager, however, expresses the opinion that in the future it will be necessary to make provision for at least twenty footcandles. Using 300-watt bulbs, this intensity can be obtained with ceiling fixtures spaced 9 ft. on centers. The lower level of illumination now considered acceptable is provided by four 200-watt fixtures in an 18 x 24 ft. bay. One manager recommends that arrangements be made to supply 4 K. W. per bay for business offices, and not less than 6 K. W. for medical offices. He also suggests that separate fuse boxes be installed in medical bays. In calculating the electric load, the present practice is to allow 4 or 4½ watts per sq. ft., but there is some tendency toward a higher standard.

Soundproofing

Managers are practically unanimous in the opinion that soundproofing is necessary, particularly in the first three to five floors. Some prefer soundproof ceilings only; others would apply the principle to the design of walls, floors, and ceilings throughout the building. It is pointed out that soundproof partitions give the occupant of a room in an office divided by a T-shaped partition far more privacy than he ordinarily has, while soundproofing is needed in large offices to deaden the sound of typewriters and business machines.

GARAGE, SHOPPING CENTER, AND BONDED WAREHOUSE

New parking facilities and a system of underground trafficways will link the eleven office buildings of Rockefeiler Center into one huge unit.



Reinhard and Hofmeister, Corbett and MacMurray, Wallace K. Harrison, J. Andre Fouilhoux, Architects

Newspictures, Inc.

Above: An air view rendering of Rockefeller Center, New York, as it will appear upon completion. The parking garage and the new Associated Press building flank the tall R.C.A. building on the left and right respectively. Left: Underground traffic diagram of the development. White areas are circulation spaces at the concourse level; shaded area enclosed by dotted lines indicates extent of warehouse and trucking facilities.

WITH COMPLETION of the Associated Press Building, Rockefeller Center nears its final stage of development as the world's largest group of related office buildings under one management. The group already contains nearly four million sq. ft. of net rentable area as a result of building which has been nearly continuous since 1930. Completion of the two final buildings now under construction—Nos. 8 and 11 on the diagram above—will swell this total by nearly half a million sq. ft.

Significant among elements of planning and design that contributed to the success of Rockefeller Center is the integration of its thirteen buildings (two theatres, eleven office buildings) into a single compact operating unit. Centralized control and management of a three-block area have made possible the development of pedestrian trafficways below the street level and creation of an extensive shopping center on the concourse level. This undersurface street system will be linked to the new subway at Sixth Avenue and has already proved a means of reducing surface congestion during rush hours.

Automobile parking will become—for the first time in New York—an integral part of office building design when Building No. 11 is completed to house 800 cars and over 200,000 sq. ft. of net rentable area.

Commercial storage space as part of an office building is a comparatively new idea that has proved to be a profitable addition to Rockefeller Center facilities. A bonded warehouse is located in the service basement reached by a ramp that enters the new Associated Press Building (No. 7) at 50th Street. It provides convenient storage and trucking areas for importers and prevents street congestion which would otherwise be caused by delivery trucks.

News Pictures Inc.

GENERAL PURPOSE OFFICE BUILDING

ASSOCIATED PRESS BUILDING

ROCKEFELLER CENTER, NEW YORK

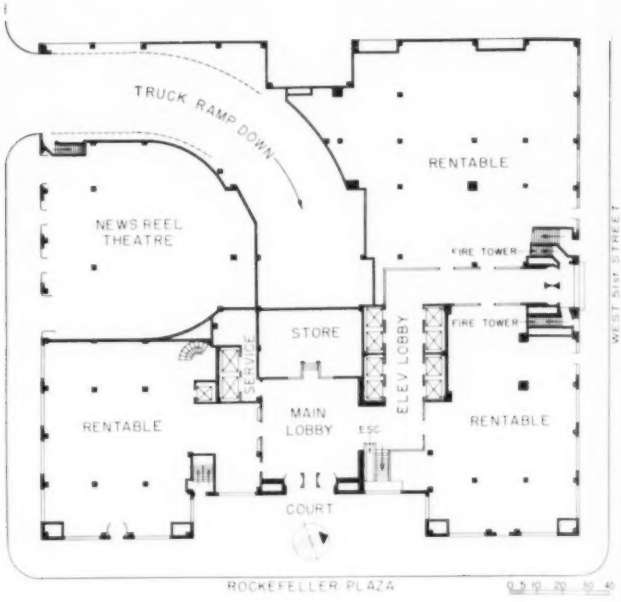
PLANNING and construction of the building were complicated by the presence of the truck ramp which runs through the first floor and concourse down to the service level. The ramp structure is entirely independent of the building which surrounds it. Column spacings throughout the building's height had to be modified from the ideal established for Rockefeller Center as a whole; so did elevator and other service locations.

In the service basement, ramp columns are clearly identifiable. Storage space is used partly in conjunction with the bonded warehouse which serves all the buildings, partly for usual building requirements.

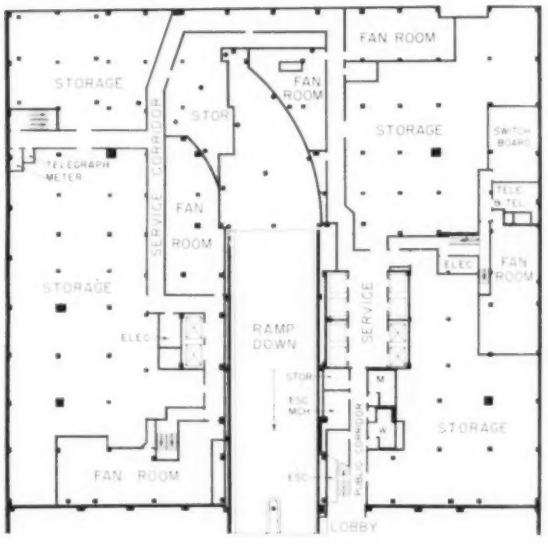
At concourse level, the connection to the public lobby in the adjacent building (No. 6) gives access to an escalator and stairs connecting with the lobby above.

On the first floor the newsreel theater fitted naturally into the ramp's curve; at least one rentable space is to be occupied by a business firm for public showrooms, with office space on the floor above. Notice that between the first and third floors the fire tower and other stairs cross over from exterior wall locations to the core of the building. The third floor is occupied by the administrative offices of Rockefeller Center. The fourth to seventh floors have been leased to the Associated Press. The larger columns shown in the plan are "wet" and carry hot and cold water, and soil stacks.

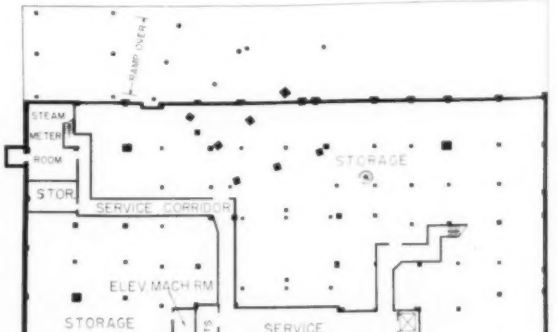
Effects of the truck ramp on typical floors are clearly visible on the upper floor plans. Notice the location of the elevators with respect to rentable floor area, which results in extremely shallow rentable space between the rear of the service core and the setback walls. As with most Rockefeller Center buildings, setback roofs are used for gardens. Sixteenth and seventeenth tiers, not shown, contain cooling towers, elevator machinery, fan rooms, and exhaust chambers.



First floor

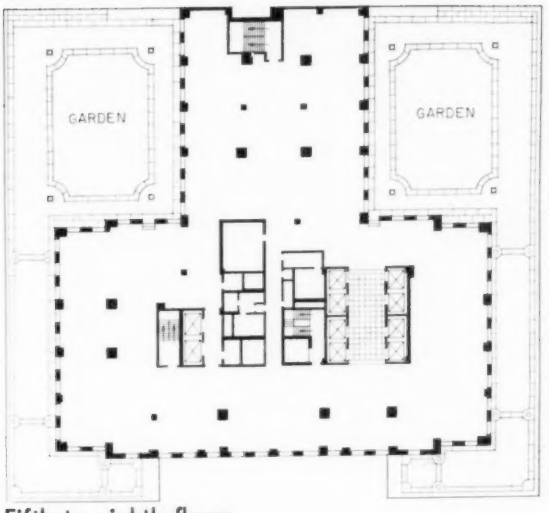


Concourse

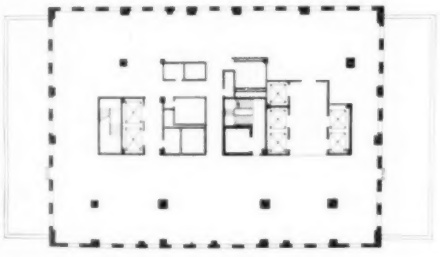


Service basement

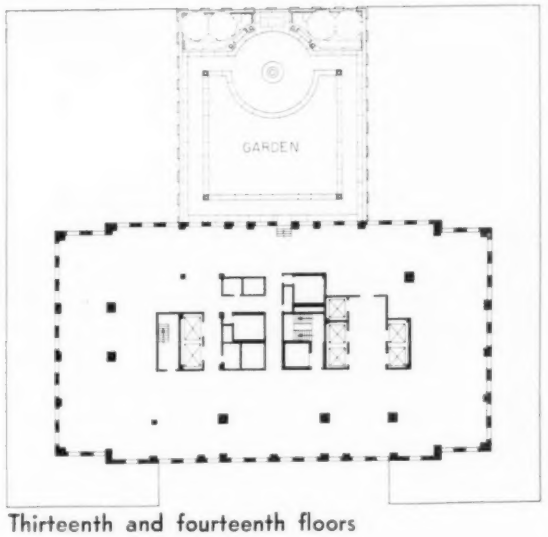
Third floor, occupied by administrative offices of Rockefeller Center, Inc. 1, general office. 2, private office. 3, executive office. 4, conference. 5, coatroom. 6, plan room. 7, storage. 8, waiting room. 9, dupligraph room. 10, consolidated stockroom. 11, switchboard. 12, reception. 13, women. 14, men. 15, vault. 16, consolidated file room. 17, mailing. 18, rest room. 19, quiet room. 20, executive's toilet.



Fifth to eighth floors



Fifteenth floor



Thirteenth and fourteenth floors

Reinhard and Hofmeister, Corbett and MacMurray, Wallace K. Harrison, J. Andre Fouilhoux, Architects

MATERIALS AND EQUIPMENT

FOUNDATION

Reinforced concrete

STRUCTURE

Steel frame

FLOORS

Floors cement generally; abrasive and hardener in trucking and shipping spaces; hydrolithic finish in storage spaces; terrazzo in public lobbies, elevator corridors, etc.; tile in toilets and washrooms

WALLS

Base: Cement in shops; tile in toilets; terrazzo in main lobby; marble in elevator corridors; removable metal base at exterior walls of rentable areas

Wainscot: Steel in trucking and shipping areas; cement plaster in service basement washrooms; tile in toilets; bronze in escalator and stair hall

Wall: Smooth cinder block and brick in shipping platform, ramp, and service areas; enameled brick in shipping and trucking areas; plaster and marble in public areas; face brick, common brick, sandlime brick, and smooth concrete block in sixteenth and seventeenth tiers; sandlime brick in fire tower

CEILINGS

Plaster generally; unfinished in service and storage areas; hung plaster ceiling with asbestos insulation above, in steam-meter room; suspended metal lath and plaster in shop areas, public spaces, toilets, and in rentable space as required

Haskell

INSURANCE COMPANY'S HOME OFFICE, BOSTON, MASSACHUSETTS

Chester Lindsay Churchill, Architect

LIBERTY MUTUAL INSURANCE COMPANY

THE SITE was selected with a view to reducing traffic congestion and parking difficulties, convenient transportation, and permanently satisfactory light and air on at least three sides. The neighborhood is noisy, but methods of construction and the fact that the upper stories are set back from the building line minimize this defect.

Plan features

Perhaps the most notable feature is the column spacing, which was fixed to give maximum amounts of usable floor space in upper stories, eliminating columns in working bays.

Addition of future upper stories over wings is provided for in existing framing. Incorporating a large central fire tower, and centralizing circulation about it, permitted the omission of two stairways. Flexibility and convenience of floor areas were enhanced by using movable partitions.

Construction

Dead loads were reduced by: Placing concrete floor slabs on top of beams, saving 4 in. fill; using gypsum block fireproofing generally around beams, saving also on cost; constructing tower roof of gypsum plank. These measures reduced foundation loadings, which were otherwise complicated by at least three factors.

First was the unusual column spacing referred to before. Consideration of spans together with results of test borings (bearing soil was soft blue clay in a stratum 90 ft. thick) resulted in selecting a system of clustered caissons, each supporting two or more columns. Second, lower portions of exterior walls were carried on the basement walls, which were cantilevered from the same clusters of caissons. Basement walls thus became in essence a reinforced, continuous, concrete beam, containing positive and negative steel. Third, a very high retaining wall at the rear driveway, extending from sub-basement to grade, was supported at driveway level by horizontal concrete beams which also formed the driveway floor. These beams developed a horizontal thrust which was also carried into the basement.

Heating and air conditioning

Heating and air conditioning were combined into a "split" system, with six zones of steam heating and eight of air conditioning. Steam is purchased. All controls are automatic, and are brought together in the sub-basement, from which point manual re-

mote control is also possible.

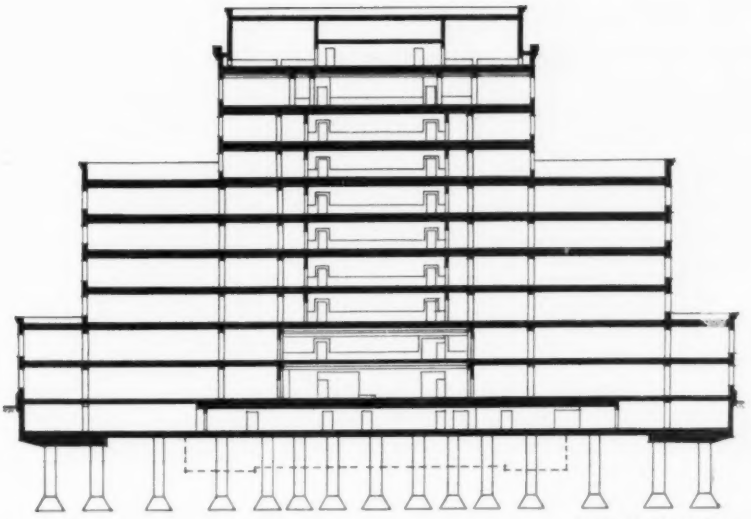
The steam-heating system comprises four exposure zones, one to each compass point, and two zones of "hot-blast" heating for the lobby. Automatic controls for exposure zones are placed in the building walls, and are sensitive to outside temperatures, sun, shadows, and wind infiltration. Lobby zone controls are similar, operating by pressure modulation. Radiators are cast iron convectors, with precision metered orifices, return traps being omitted. This permits radiators to be sealed without anticipation of repairs.

The eight winter air-conditioned zones are served by four groups of apparatus. Possible expansion of equipment and controls, for future summer conditioning, was considered and provision made for it. One shaft is used for the common exhaust from all floors. Exhaust inlets are located near floors at the center of the building. Supply outlets are in general at ceiling levels, in the faces of beams. Supply ducts at present extend to the 6th floor and are designed for future extension to all floors. The 9th floor is supplied with conditioned air from individual cabinets under each window, and air is exhausted through individual room inlets.

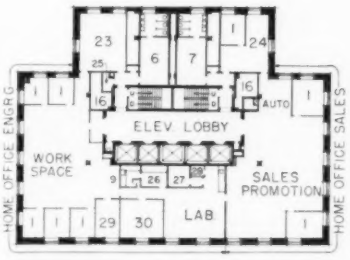
This combination of heating and conditioning was chosen to provide maximum flexibility in control and uninterrupted service and a minimum of steam consumption, maintenance, and repair. Flexibility was extremely important because portions of the building might be occupied at odd hours, and the system had to be capable of heating such portions without heating the entire structure.

Electrical systems

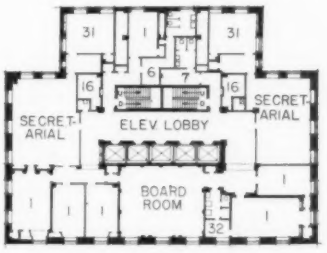
The wiring system is 3-phase, 4-wire, 120-208 volts, designed for a maximum of economy, flexibility for power and lighting, and minimum installation expense. The under-floor ducts are laid in a checkerboard system, with parallel ducts, one for telephone, bells, and buzzers, the other for machines. Lighting outlets are somewhat widely spaced and use high wattages. Lighting fixtures in all areas were chosen after exhaustive tests, made when the building had been completed, but before occupancy. Fixtures were rated for appearance, footcandles delivered at certain wattages, cost, ease of maintenance and similar pertinent features. The average light intensity delivered is 17 footcandles at desk level.



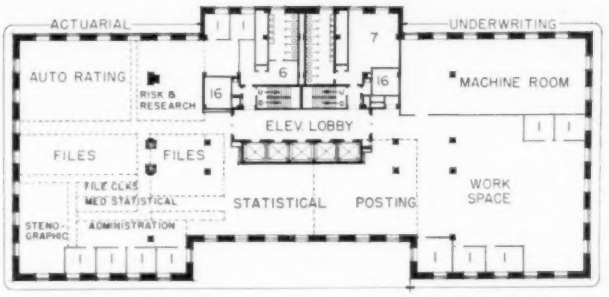
Diagrammatic section



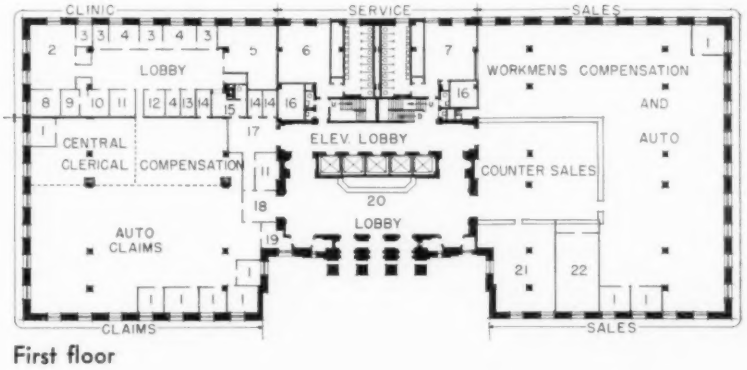
Eighth floor



Ninth floor



Fifth floor



First floor

Legend: 1, private office. 2, clinic. 3, examination room. 4, doctor's room. 5, baking and massage. 6, men's lockers. 7, women's lockers. 8, operating room. 9, darkroom. 10, X-ray room. 11, storage. 12, sterilizing. 13, nurses' room. 14, conference. 15, clinic waiting space. 16, duct shaft. 17, waiting space. 18, public space. 19, attorney waiting space. 20, information. 21, collections. 22, cashier. 23, projection room, drivers' tests. 24, general service. 25, projection booth. 26, microscope room. 27, dust room. 28, balance room. 29, engineering library. 30, laboratory office. 31, executive office. 32, anteroom.

INSURANCE BUILDING
BOSTON, MASSACHUSETTS

MATERIALS AND EQUIPMENT

FOUNDATION
Reinforced concrete; test borings, Raymond Concrete Pile Co.

STRUCTURE
Steel, American Bridge Co.; sand-lime brick interior partitions, Parry Brick Co.; reinforced concrete slab floors

EXTERIOR
Walls: Brick; limestone facing, Indiana Limestone Corp.; base, pink granite, Swenson Granite Co.; main entrance, glass block, Corning Glass Works. **Sash:** Steel casement, Detroit Steel Products Co. **Roof:** Tar and gravel on structural gypsum, concrete slab. **Insulation:** Cork, at all roof levels; sectional partitions packed with Rock-Wool.

INTERIOR
Floors: Basement, granolithic; lobby and vestibules, rubber mats, American Mat Co.; terrazzo, De Paoli Mosaic Co.; asphalt tile, David E. Kennedy Co.; linoleum, Sloane-Blabon and Congoleum-Nairn ("Sealex"); rubber, "Air pad" sheet rubber, Voorhees Rubber Mfg. Co.; ceramic tile, Galassi Co. **Walls:** Gypsum plaster; tile; travertine; main lobbies, Italian travertine, Vermont Marble Co.; office partitions, painted and glazed, 3⅞-in. "Transite", Johns-Manville Corp.; machine, tabulating and addressograph rooms, Acousti-Celotex tile, 1¼-in. Type BBB. **Doors:** Main entrance, bronze, General Bronze Corp.; hollow metal, Jamestown Metal Corp.; vault, York Safe & Lock Co. **Ceilings:** Corridors and lobbies, plaster; 8th and 9th floors, acoustic plaster; other floors, "Sanacoustic" tile, Johns-Manville Corp.

EQUIPMENT
Elevators: Otis Elevator Co.; cabs, W. S. Tyler Co.—speed, 500 ft.-min., 3,000-lb. capacity, full automatic floor control in lobbies and cars. **Hardware:** Yale & Towne. **Plumbing:** Brass pipe, Anaconda Wire & Cable Co., American Brass Co.; "Duriron" acid-resisting pipe; steel, National Tube Co.; wrought-iron, Byers Co.; brass fittings, Walworth Co.; pumping equipment, Dayton-Dowd; sprinkler heads, Reliable Automatic Sprinkler Co.; fixtures, Crane Co. **Heating and Ventilating:** American Radiator convectors; exposed radiation, Shaw-Perkins; heating specialties, Hoffman Specialty Co.; temperature indicating system, American Temp. Indicating Co.; pipe, copper-bearing steel, National Tube Co.; zone control system, Tallmadge Co.; primary and secondary heaters, Aerofin Corp.; valves, Walworth Co.; motors and controllers, G.E.; air-conditioning cabinets, 9th floor, Carrier. **Electrical:** Switches, Hart & Hegeman, Automatic Switch Co., Trumbull Elec. Co.; circuit breakers, Westinghouse; motor starters, G.E.; receptacles, Bryant; duct, steel, Walker Bros.; outlet boxes, National Electric; cable, "Simplex", and American Steel & Wire Co.; switchboard, Westinghouse. **Waterproofing:** Basement, plaster coat, "Ironite"; spandrel beams, membrane, through walls; forecourt and rear ramp, three-ply membrane; expansion joints in all copings. **Toilets:** Partitions, Henry Weis Mfg. Co.; soap dispensers, West Disinfecting Co. **Storage:** Shelving, steel, adjustable, Berger Mfg. Co.; lockers, steel, Metal Office Furniture Co. **Dust Room:** A. O. Wilson Structural Co. **Office equipment:** Furniture, Stow-Davis Furniture Co., Daten-Dunton Desk Co., Paine Furniture Co.; mailing room, General Fireproofiing Corp.

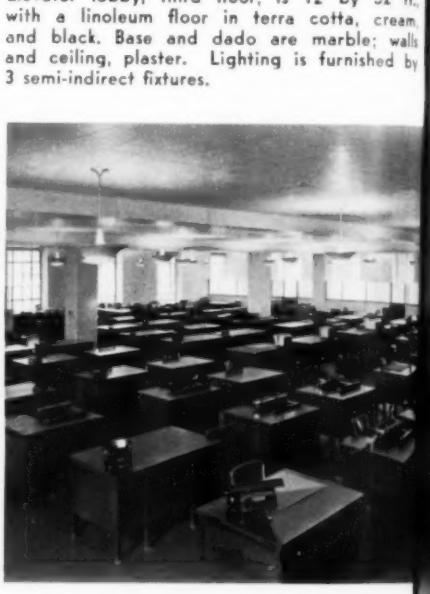
Cost, not including architect's fees, approximately 57¢ per cu. ft.

Photos by Ben Schnall

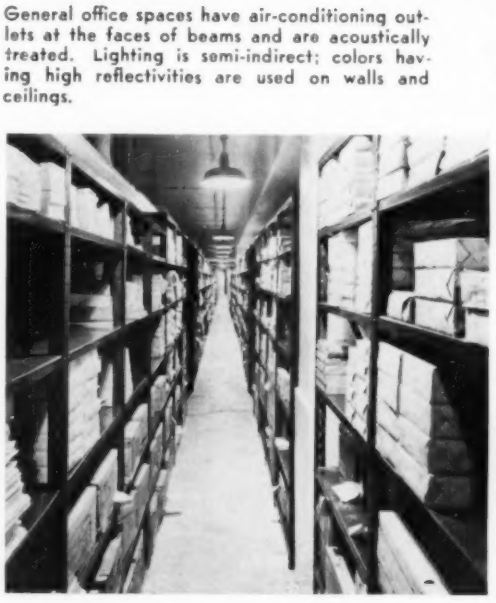
Main lobby is 22 by 72 ft., 27 ft. 6 in. high. Lighting is provided by 14 down-light projectors, 300 watts each. Floors are terrazzo; walls travertine with plaster panels for murals. Ceiling is painted medium blue.

Elevator lobby, third floor, is 12 by 52 ft., with a linoleum floor in terra cotta, cream and black. Base and dado are marble; walls and ceiling, plaster. Lighting is furnished by 3 semi-indirect fixtures.

General office spaces have air-conditioning outlets at the faces of beams and are acoustically treated. Lighting is semi-indirect; colors having high reflectivities are used on walls and ceilings.



Typical work space. Number of persons employed varies through the year, but averages as follows: Basement, 50; 1st floor, 160; 2nd, 206; 3rd, 167; 4th, 140; 5th 220; 6th, 96; 7th, 52; 8th, 35; 9th, 28; total, 1,154.



Basement supply space is equipped with 1,020 units of shelving in depths varying from 18 to 42 in. Shelving height is usually 8 ft. 3 in., sometimes 6 ft. 8 in. or 7 ft. 3 in. Lighting is of the direct type.

Typical locker room. These vary in size and capacity; the largest contains 93 lockers in 465 sq. ft. There are 18 such rooms. Lighting is standard direct, diffused.

Executive's office and waiting space, 9th floor, has a linoleum floor, slate base, and walls of glass block, wood, and plaster. Ceilings are of acoustical plaster; lighting by semi-indirect fixtures.

Vice-president's office, 9th floor. Floor is of linoleum; base is marble; walls are wood paneled; and ceiling is of acoustical plaster. Lighting is furnished by two semi-indirect fixtures.

Purchasing dept. waiting space on 2nd floor is 11 ft. 6 in. by 12 ft. Floor is linoleum; base, slate; walls, plaster. Ceiling is of acoustical tile set in panels between the beams.

Typical tabulating machine space. These have walls as well as ceilings acoustically treated, this one using "Acousti-Celotex" perforated tile. Floor is linoleum; base, slate; and lighting is semi-indirect.

Clinic on first floor is an important unit containing 20 rooms. Floor is rubber; base, slate; sectional partitions are painted. Lighting is in general indirect, although the unit here shown is semi-indirect.

Chemistry laboratory on 8th floor contains 600 sq. ft. Floor is asphalt tile; otherwise finish is similar to other areas. Among several rooms served is a dust-testing room, built air-tight, for air-supply and exhaust calibration.

Typical washroom. These vary from 120 sq. ft. to 340 sq. ft. in size. Lighting is standard direct, diffused. Walls, floor, base, and dado are ceramic tile in shades of tan with black trim.

Kitchen floor and base are tile; walls and ceiling, acoustic plaster; lighting direct, diffused. Equipment includes hot plates, toasters, sinks, refrigerators, incinerator, dishwasher, cabinets, and glass and plate tables.

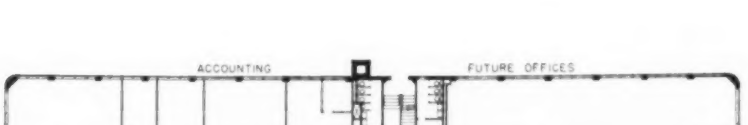
Lunch room is 39 ft. 6 in. by 53 ft.; contains 43 tables, 171 seats. Lighting is standard direct, diffused. Floor is rubber; base, slate; walls and ceilings, acoustic plaster.

Photos by Chicago Arch. Photo. Co.

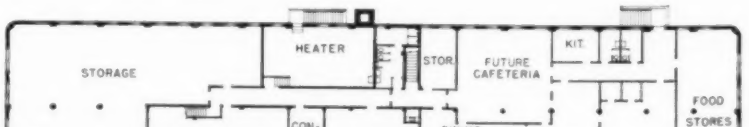
AIR LINE'S HEADQUARTERS
CHICAGO, ILLINOIS

Albert Kahn, Architect

Second floor



First floor



Basement

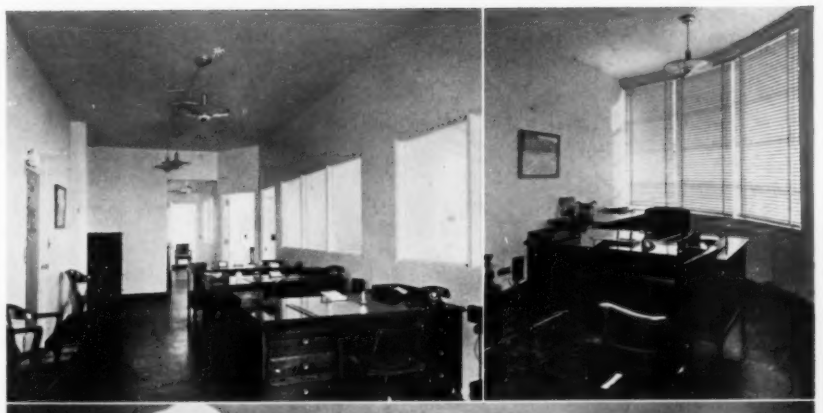
UNITED AIR LINES TRANSPORT CORP.

ALL OFFICE AREAS are lighted by 300–500 watt indirect fixtures. The average per square foot is 4 watts, furnishing 25 footcandles in offices, 40 footcandles in drafting rooms.

Large areas are surfaced with "Acoustone-W" Mineral Tile, which has a sound reduction coefficient of .60 and a light reflection coefficient of .70. Paint on the walls has a reflectivity of 60 percent; ceilings, 80 percent.

Most of the ventilating equipment is located in a penthouse. Air is partially recirculated and partially fresh. The ventilating system supplies about 10 percent of the maximum heating load. The remainder is supplied by a 2-pipe, forced circulation, hot-water system with concealed copper fin radiators. The entire heating system is thermostatically controlled for all variations of outside temperature with automatic valves controlling various portions.

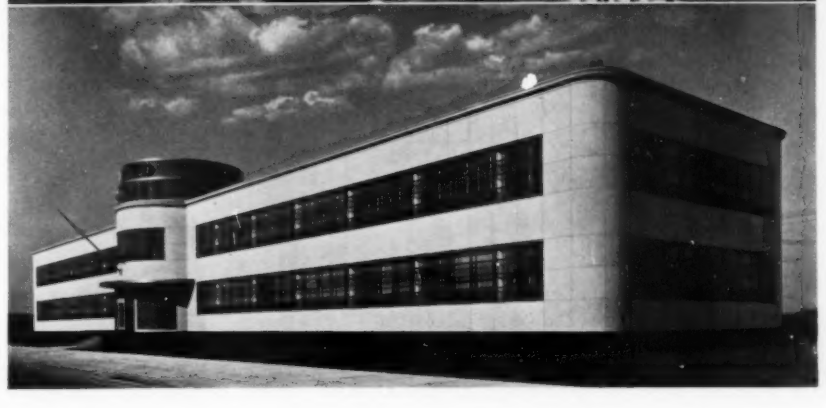
Photos at right: 1, typical office; 2, president's office; 3, basement kitchen; 4, entrance lobby; 5, exterior.



1, 2

3

4



5

MATERIALS AND EQUIPMENT

FOUNDATION

Concrete

STRUCTURE

Reinforced concrete frame

EXTERIOR

Walls: Black granite base and entrance, American Black Granite Co.; Indiana limestone, Ingalls Stone Co.; glass brick, Owens-Illinois Glass Co.; face brick, Moulding-Brownell Co.
Sash and doors: Architectural projected steel sash and screens, Hope's Windows, Inc.; sills, aluminum; doors, main entrance, metal (revolving), others, wood and hollow metal, Trussbuilt Co.
Roof: Tar and gravel roofing; copper flashings
Insulation: Cork, United Cork Co.

INTERIOR

Floors: Concrete with linoleum generally; terrazzo in toilets, stair hall; quarry tile in kitchens, commissary; rubber tile in executive offices
Partitions: Gypsum block generally; hollow tile in kitchens, commissary; glazed tile in toilets; metal partitions, Henry Weiss Mfg. Co.; marble, Vermont Marble Co.
Trim: Hollow metal and wood, Trussbuilt Co.
Ceilings: Plaster, painted; acoustic ceilings in lobby and special offices, Celotex Corp.

EQUIPMENT

Electrical: Mild steel tube conduits, Clayton Mark Co.; clock system; tower floodlighting, Westinghouse Electric & Mfg. Co.; power panels, C. J. Petersen Co.; light panels, Major Equipment Co.; circuit breakers, I.T.E.; wire and cable, Rome Cable Corp.; intercommunicating telephone system
Plumbing: Hot-water and recirculating lines, copper tubing; fixtures, vitreous china, Standard Sanitary Mfg. Co.; floor drains, Boosey Mfg. Co.; soil pipe and fittings, Sommerville Iron Wks.; valves and fittings, Walworth Co.; faucets, Chicago Faucet Co.; vitrified tile pipe, N. A. Williams; flush valves, Sloan Valve Co.
Heating: Forced circulation two-pipe hot-water system, concealed radiation, copper; radiator valves, J. P. Marsh Corp.; oil burners, Todd Combustion Equipment Co.; unit heaters, Perfex Corp.
Air Conditioning: Installed as designed by architect
Hardware: Russell & Erwin Co.

Cost of building: 51.6¢ per cu. ft.

Photos by Chicago Architectural Photo. Co.

OFFICES FOR A STATISTICAL RESEARCH ORGANIZATION, CHICAGO, ILLINOIS

The Benjamin H. Marshall Co., Architects

A. C. NIELSEN COMPANY

MATERIALS AND EQUIPMENT

FOUNDATION

Reinforced concrete

STRUCTURE

Reinforced concrete

EXTERIOR

Walls: Red brick, Western Brick Co.
Sash: Wood, double-hung
Roof: Two-inch cork insulation, quarry tile deck on main roof; penthouse, roofing composition; sheet metal, lead-coated copper
Insulation: Sprayed-on rock wool on all exterior walls with two layers "Fibrewove" insulating paper No. 7, saturated and coated, Philip Carey Co.

INTERIOR

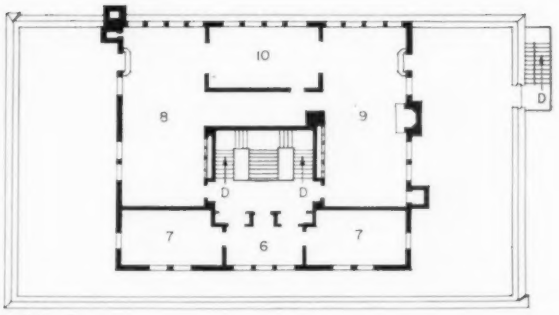
Walls: Hollow tile plastered and painted; wainscot in offices, Flexwood, U. S. Plywood Corp.; wainscot in reception hall and stair hall, walnut
Floors: Work spaces and offices, asphalt tile; public corridors, stair hall, reception hall and toilet rooms, terrazzo; stairs, Chicago Art Marble Co.
Ceilings: Lobby, stair hall and public corridors, plastered; private offices, more important and noisier work spaces, "Perfatile," U. S. Gypsum Co.; remainder of spaces, "Acoustone," U. S. Gypsum Co.
Doors and trim: Reception hall, stair hall, public corridors and private offices, walnut and maple; secondary private offices and work spaces, birch, stained walnut
Painting: Public corridors, light buff; work spaces, light grey with greenish touch; wainscot, medium grey-green

EQUIPMENT

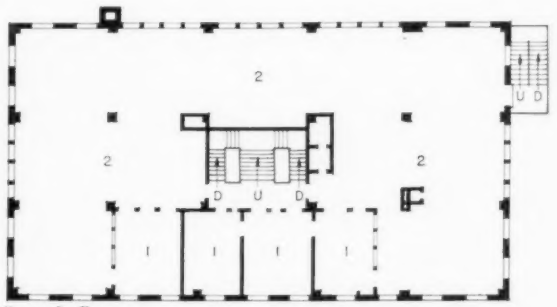
Heating and air conditioning: "Moderator" heating system with vacuum pump, Warren Webster Co.; temperature controls, Johnson Service Co.; air-conditioning compressors, Westinghouse Elec. & Mfg. Co.
Plumbing: Fixtures, Kohler Co.
Incinerator: Kerner Incinerator Co.
Vault: Mosler Safe Co.
Electrical: Full indirect lighting; fixtures, Curtis Lighting, Inc.; electric dumbwaiter, Otis Elevator Company
Toilet rooms: Stalls, Fiat Metal Mfg. Co.
Service kitchen: Albert Pick Co.

Cost for building only: $219,574.27

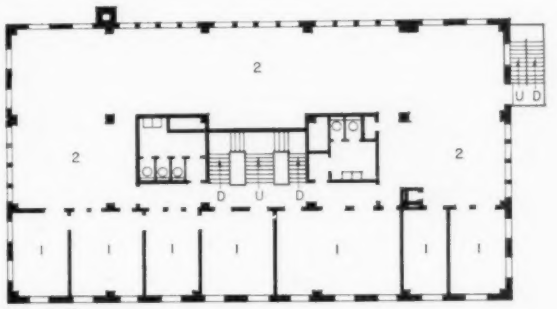
Top photograph, typical work space; lower, employees' recreation room. This building is a modernized structure. The principal problem was laying out floor space to fit special requirements of the business. Many private offices are necessary for report writers. Large working spaces are used by checkers, Comptometer operators, typists, etc. The second floor library is in effect a vault for filing official reports. Another vault is provided in the basement. Sample rooms in the penthouse are set up as a drugstore and grocery store and are used for training the field staff. Mechanically, the building is completely air conditioned, insulated, has acoustically treated ceilings and indirect lighting.



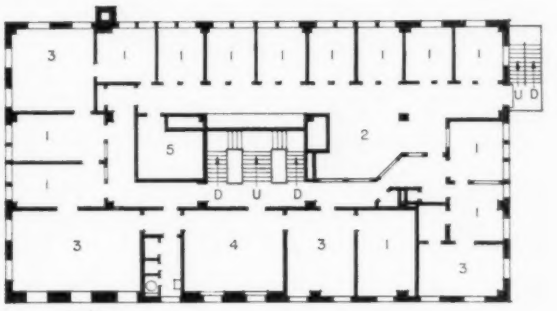
Fifth floor



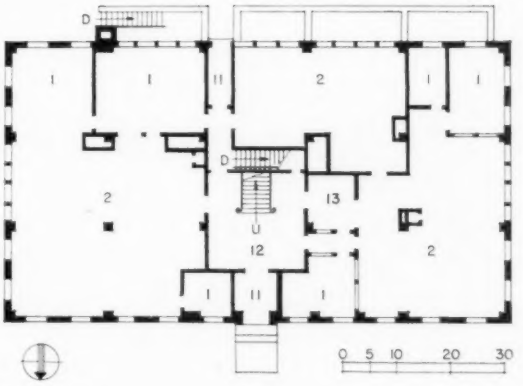
Fourth floor



Third floor



Second floor



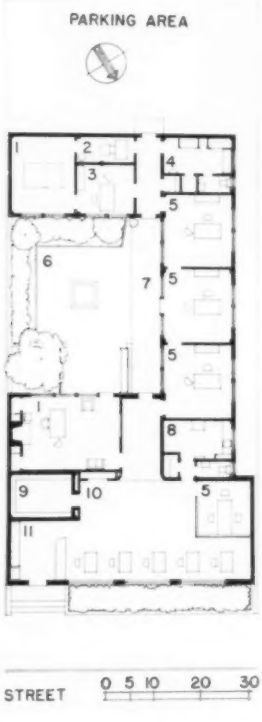
First floor

1, private offices. 2, general work space. 3, executive offices. 4, conference room. 5, library. 6, anteroom. 7, sample room. 8, recreation room. 9, clubroom. 10, executives' room. 11, vestibule. 12, lobby. 13, switchboard.

Photos by Miles Berne

ONE-STORY OFFICE BUILDING
LOS ANGELES, CALIFORNIA

Winchton Leamon Risley, Architect

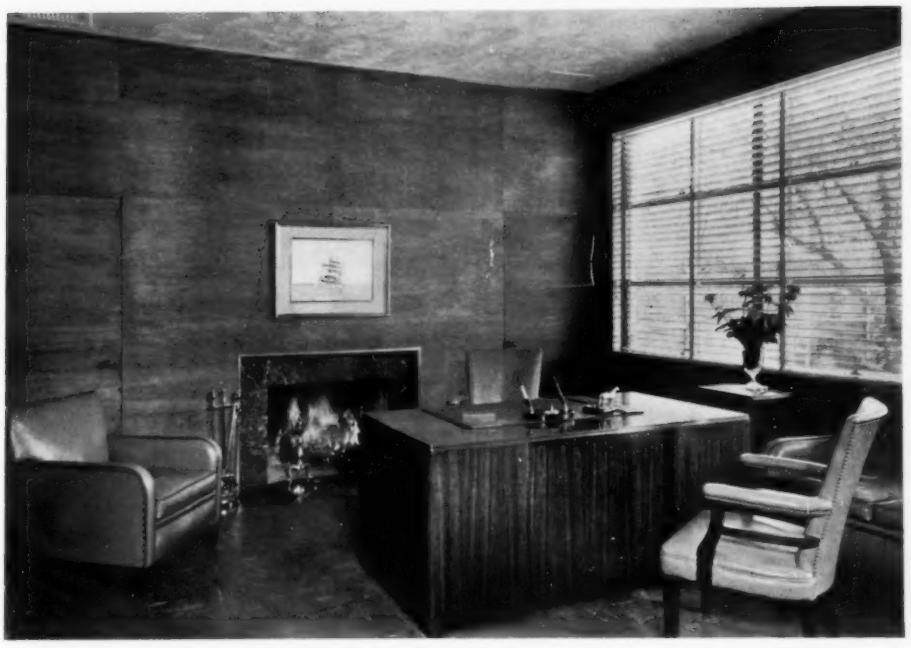


1, executives. 2, heater. 3, conference. 4, men. 5, private offices. 6, patio. 7, roofed gallery. 8, women. 9, vault. 10, work space. 11, entry.

THE O. C. FIELD GASOLINE CO.

IN KEEPING with what has become traditional "California" residence planning, the patio is used in this one-story office building and serves to provide economical circulation and outdoor conference space. It also affords natural light and a pleasant outlook for all private offices, and provides pleasant surroundings for both employees and business visitors. The parking area in the rear of the building is reached from an adjacent street.

The heater room was located in the rear of the first floor in order to eliminate any necessity for a cellar, thus aiding in reducing costs to a minimum.



At top, general office space; below, executive's office. Use of parchment-colored stucco and henna-colored doors relieves the simplicity of the interiors; executive's office is in natural walnut-faced plywood.

MATERIALS AND EQUIPMENT

FOUNDATION
Concrete

STRUCTURE
Reinforced concrete

EXTERIOR
Walls: Poured concrete; stucco on brick chimney; painted light green with rust-colored dado and cornice, "Semolith"

Roof: Five-ply, built up with gravel

Insulation: "Silvercote" insulation fabric between roof joists and furred-down ceiling, Specialty Converters, Inc.

Sash: Side-hinged steel, Druwhit Metal Products Co.; bronze screens

Waterproofing: All concrete walls, "Suconem", Super Concrete Emulsions, Ltd.

INTERIOR
Walls: Parchment-colored stucco; Office No. 2, natural walnut finish plywood panels, "Ailon", U. S. Plywood Co.

Ceilings: Parchment-colored stucco

Floors: Reinforced concrete slabs; asphalt tile finish, Seaside Products Corp.

EQUIPMENT
Heating: Hot-air and air-circulation systems, Payne Furnace & Supply Co.
Plumbing: Galvanized steel pipe; fixtures, gas hot-water heater, Crane Co.
Lighting: Semi-indirect, General Electric Co.
Hardware: P. & F. Corbin
Glass: Standard, American Sheet Glass; glass block over front door, "Insulux", Libby-Owens-Ford Glass Co.
Decorative tile: Gladding, McBean & Co.
Acoustical treatment: Ceilings of offices 1, 2, 3, 4, 5, and 6 have acoustical plaster on metal lath. Plaster, Blue Diamond Corp., Ltd.

Cost, including interior finish, excluding fees: 32¢ per cu. ft.

PLANT ADMINISTRATION OFFICES

DAYTON, OHIO

The Austin Company, Engineers

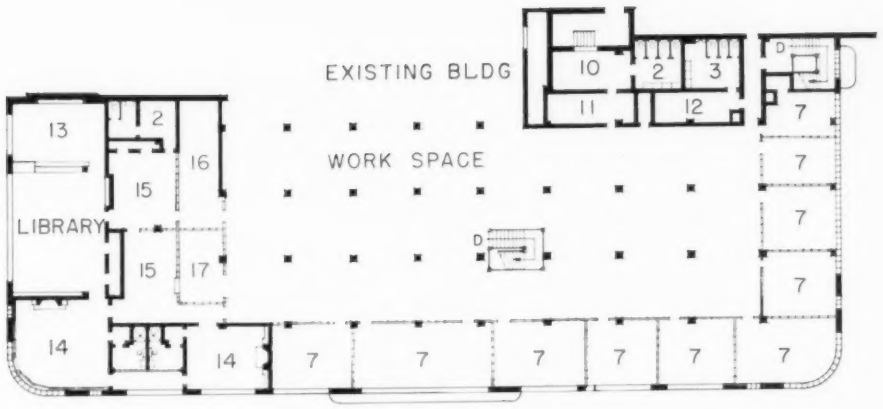
THE STANDARD REGISTER COMPANY

SINCE THIS company's business is the manufacture of precision forms to eliminate waste motion in offices, it is natural that its new administration building should be designed with the same end in view. It is all-year air conditioned, acoustically treated, and lighting is General Electric engineered.

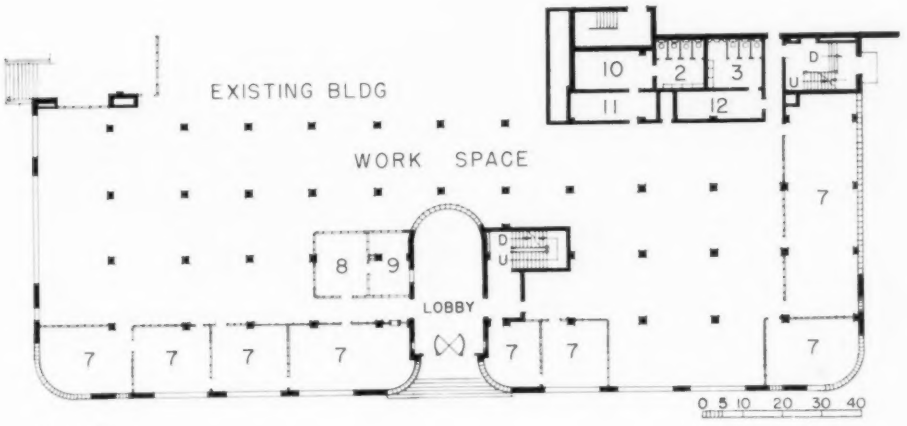
The air-conditioning system will maintain an average temperature of 80° with 50% relative humidity when the outside temperature goes to 90° in summer. The system operates in combination with direct radiation and is under thermostatic control with 7 zones. Cooling is provided by a combination of well water and mechanical refrigeration. In addition, well water is sprayed on the office roof to minimize heat absorption.

The office shown at the top of the page is a transcribing room. Directly outside this runs the main line of the Big Four Railroad, yet by use of glass block exterior walls and acoustical ceiling treatment, the noise level is sufficiently reduced so that it does not disturb the workers. All interior glass block partitions are set upon special rolled steel channel bases which provide raceways for electrical conduits. These, together with the hollow door jambs which function similarly, permit the concealment of all wiring which would otherwise have been rendered difficult or unsightly. The lighting is accomplished by a combination of Mazda lamps and mercury vapor lamps in spun aluminum reflectors. Twenty footcandles are delivered on working planes. Assembly hall, shown on the plans on facing page, is necessary for salesmen's conferences, and the kitchen and cafeteria will be used in the same connection.

On the second floor, the principal portion is devoted to a general office with a ceiling height of 25 ft. and surrounded by glass block walls. The upper portion of these is a monitor, providing natural lighting which is sufficient for all but the darkest days.

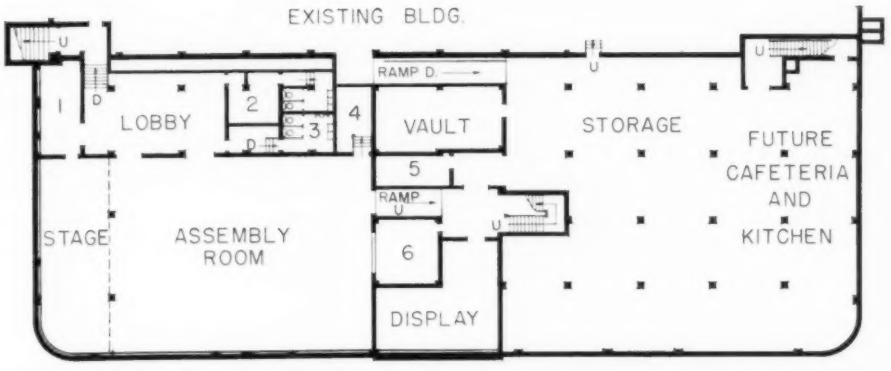


Second floor



First floor

Legend for plans: 1, checkroom; 2, women; 3, men; 4, chair storage; 5, telephone equipment; 6, projection room; 7, offices; 8, teletype; 9, telephone and information; 10, rest room; 11 & 12, coatroom; 13, conference room; 14, private office; 15, secretary; 16, records; 17, waiting room.



Basement

MATERIALS AND EQUIPMENT

FOUNDATION

12-in. concrete to grade

STRUCTURE

Steel frame

EXTERIOR

Walls: Grade to first floor, face brick, concrete wall backing; first floor to roof, face brick, clay tile backing, Alliance Brick Co.

Roof: Tar and gravel, 15-year-guaranty bond, Philip Carey Co.; sheet metal, 15-year-guaranty bond flashing system

Insulation: One-inch cork insulation nailed to wood roof sheathing, Armstrong Cork Prod. Co.
Sash: Monumental windows, Truscon Steel Co.
Trim: Art stone sills, heads, coping, George Rackle & Sons

INTERIOR

Walls: Glass block, Owens-Illinois Glass Co.; clay tile plaster; executive offices, oak panels
Floors: Concrete ribbed type, metal forms; asphalt tile; lobby, terrazzo
Doors: Wood with metal frames
Stairs: Metal pan type; terrazzo filled treads and landing

EQUIPMENT

Air Conditioning: Delco Frigidaire; fans, American Blower Co.; filters, American Air Filter Co.; automatic control, Minneapolis-Honeywell Regulator Co.; motors, Delco, General Motors Corp.; sheet metal, American Rolling Mill

Electrical: Combination Mazda and high intensity indirect fixtures providing 20 foot-candles; fixtures, Miller Co. and Curtis Lighting; lighting panels, "no fuse" type, Trumbull Electric Co.

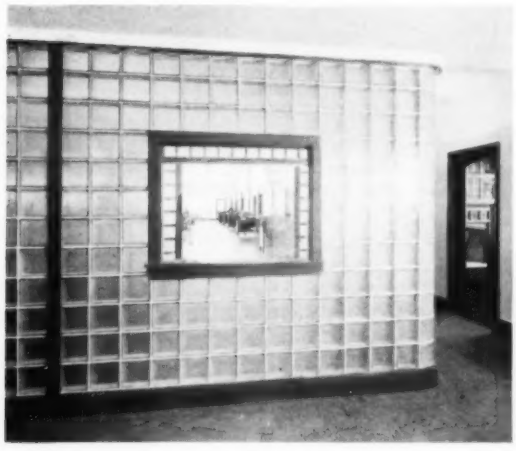
Plumbing: Fixtures, china, The H. J. Osterfeld Co.; toilet ventilators, Allen Turbo-Ventilors

PLANT ADMINISTRATION OFFICES **Dayton, Ohio**

Standard Register Company

General office, second floor. Note that air-conditioning ducts are treated as ceiling beams.

First floor lavatory and toilet. Conditioned air is not recirculated from this zone.



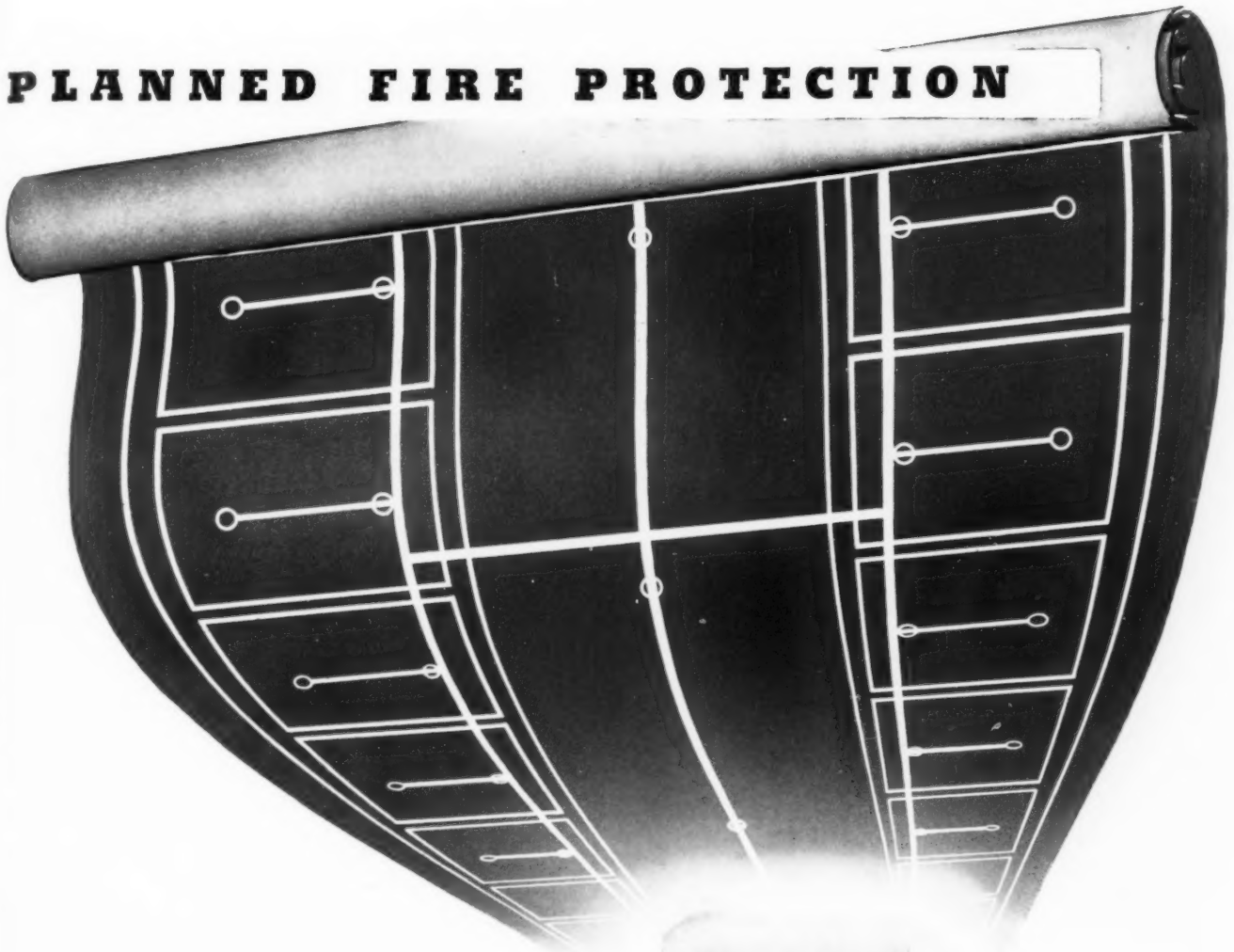
Looking from private secretary's office, second floor, toward general office.

General manager's office. Notice that this office is in a radiator-heated zone.

Basement assembly room seats 500 persons and is used for conventions, etc.

Entrance lobby. In all interiors, lighting fixtures are totally indirect.

PLANNED FIRE PROTECTION



A Blended Part Of The Building's Design

Automatic Sprinkler Fire Protection has become a "must" in most new buildings. The architect who assumes this to be true, and makes provision for sprinklers while his building is still "on the boards," can more easily make the sprinkler system a blended part of the building's design.

Grinnell's thirty-four strategically-located offices are staffed by experts thoroughly familiar with the problems of sprinkler installation in modern buildings. Backed by Grinnell's Seven Standards, they are in a position to solve the difficulties that may arise in all types of building layout.

Grinnell offers you a vast store of experience accumulated in protecting over fifty billion dollars' worth of the world's property. Take advantage of it and plan your sprinkler system to complement your design. Our nearest branch office will gladly cooperate. Grinnell Company, Inc., Executive offices, Providence, R. I. Branch offices in principal cities.

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Research . . . since 1882, to meet and conquer the fast-increasing fire hazards of industry and commerce . . . one of the Seven Standards of Superiority of Grinnell Automatic Sprinkler Fire Protection.

Review of New Books

(Continued from page 81)

Methods and practices suggested in the book's twenty chapters are those of a successful engineering office in which they are applied in the daily routine, and where every suggestion is tested in actual installation and operation practices.

HEATING, VENTILATING, AND AIR CONDITIONING FUNDAMENTALS. By W. H. Severns. John Wiley & Sons, New York City, 1937. Illustrations from photographs and drawings. 467 pages. 6½ x 9¼ in. Price, $4.

THIS BOOK offers, in language not too technical for the average reader, a thorough treatment of basic principles as well as a detailed discussion of modern methods of handling heating, ventilating, and air-conditioning problems.

STANDARD PLUMBING DETAILS FOR ARCHITECTS, ENGINEERS, CONTRACTORS, PLUMBERS, AND STUDENTS. By Louis J. Day. John Wiley & Sons, Inc., New York City, 1938. With 119 drawings. 9¼ x 11¾ in. Price, $6.

A BOOK of plates showing how plumbing details fit together and what connections are required, so that the proper spaces for installation of plumbing can be provided. With the exception of diagrams, all drawings are to scale and reproduced at the actual size drawn.

This graphic explanation covers all phases of plumbing without text description since the drawings tell the complete story, and all necessary measurements are illustrated. The information is in good practice and can be counted on as sound and reliable in covering the best general modern practices in plumbing installation.

TRAINING FOR THE PAINTING AND DECORATING TRADE, BULLETIN No. 193. By L. G. Stier. United States Government Printing Office; Superintendent of Documents, Washington, D. C., 1938. 137 pages, 6 x 9 in. Price, 35c.

THE FEDERAL Office of Education offers a bulletin containing an analysis of the painting and decorating trade and an outline of plans which may be followed in training apprentices and workers in these trades; paperhanging not included. Numerous persons who have had much experience in painting and decorating trade lines cooperated to give the readers information on such subjects as: Qualifications and Opportunities for Employment in the Painting and Decorating Trade; Health and Safety Hints for Painters and Decorators; Equipment and Supplies for Classes in Painting and Decorating; and Fundamental Information for the Painter and Decorator.

TROIS SIECLES D'ART AUX ETATS-UNIS. Exhibition organized in collaboration with the Museum of Modern Art, Second Edition, 1938. With over 100 illus. 107 pages. 7¼ x 9 ½ in. Price, $1.

THE following four separate sections comprise the booklet: Painting, Sculpture, and Prints; Architecture; Photography; and Moving Pictures. Major paintings by several of the more interesting and important 18th and 19th century artists are included. Recent work has been selected with the intention of presenting a cross-section of 20th century North American art. For each section of the ex-

(Continued on page 124)

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WRITE FOR BULLETIN 564

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Review of New Books

(*Continued from page 122*)

hibition an introduction has been written in French and English.

AN ARCHAEOLOGICAL SURVEY OF THE NORRIS BASIN IN EASTERN TENNESSEE. By William S. Webb. Issued by the Smithsonian Institution Bureau of American Ethnology, Bulletin 118, 1938. Drawings, diagrams, half-tones. 398 pages. 6 x 9 in. Price, $1.

FIRST in a series of archaeological reports based on studies conducted under the direction of the Research Section, Social and Economic Division, Tennessee Valley Authority. A carefully compiled report and explanation concerning the newly excavated sites of man's prehistoric occupancy in the Tennessee Valley. These locations were inundated by completion of the Norris Dam and the consequent filling of its reservoir.

The reports include discussions on the three following major objectives of the archaeological survey:

1. The discovery of all prehistoric sites within the basin.
2. The excavation of all important sites found.
3. The recovery and preservation of all information and material of archaeological value.

Manufacturers' Publications

Electrical equipment

Bull Dog Vacu-Break Compact Type Switchboards, Bulletin No. 385. Bull Dog Electric Products Co., Detroit, Mich.

Exide Batteries — Fifty Years of Achievement, (for the consumer). The Electric Storage Battery Co., Philadelphia, Pa.

List of Inspected Appliances Relating to Accident Hazard, Automobile Equipment, Burglary Protection; September, 1938. Underwriters' Laboratories, Inc., 161 Sixth Ave., New York, N. Y.

Equipment

Arc Welding Electrodes & Accessories with Procedure for Welding of Various Metals. The Lincoln Electric Co., Cleveland, Ohio.

Asco Solenoid Valves for Steam, Gas, Liquids, and Air. Automatic Switch Co., 154 Grand St., New York, N. Y.

Be Certain of Comfort and Enjoyment. Bennett Guaranteed Fireplaces. Bennett Fireplace Co., Norwich, N. Y.

Bradley Presents A New Washfountain. Bradley Washfountain Co., Milwaukee, Wis.

Diesel Engines, Type "S." Ingersoll-Rand, 11 Broadway, New York, N. Y.

Infilco Hot-Flow Water Softeners for Boiler Feed Water Treatment. International Filter Co., Chicago, Ill.

Introducing New American Furniture. The Franklin Furniture Co., Columbiana, Ohio.

Source Material, Ornamental Metalwork, Railings (AIA-File No. 15), Treillage (AIA-File No. 15), and Saddles and Thresholds (AIA-File No. 14b53), (3 catalogs). Julius Blum & Co., Inc., 532-540 W. 22nd St., New York, N. Y.

Zinc Alloy Die Castings; in Hardware; in Industrial Equipment. The New Jersey Zinc Co., 160 Front St., New York, N. Y.

Heating, air conditioning, and insulation

Adsco Rotary Condensation Meter, Bulletin No. 35-80A. American District Steam Co., North Tonawanda, N. Y.

Autovent, the Complete Line, Bulletin No. 203. Autovent Fan & Blower Co., Chicago, Ill.

(*Continued on page 126*)

Polish National Alliance Bldg. Chicago, Illinois — *J. A. Slupkowski, Arch. Carl Metz, Eng.*

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PLYPANEL D.F.P.A.

EXT.-D.F.P.A.

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PLYFORM appears on the face of all Plyform Concrete Form Panels.

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Manufacturers' Publications

(Continued from page 124)

Heating Pumps and Accessories by Dunham, Bulletin 602. C. A. Dunham Co., Chicago, Ill.

Insulating and Cushioning Materials. American Hair & Felt Co., Chicago, Ill.

Stop Inefficient Heating, Fuel Waste, Heating Losses, Production "Lag" with Carrier Unit Heating, Bulletin No. 46E2. Carrier Corp., Syracuse, N. Y.

Trane Air Unit Heaters, Bulletin S 327. The Trane Co., La Crosse, Wis.

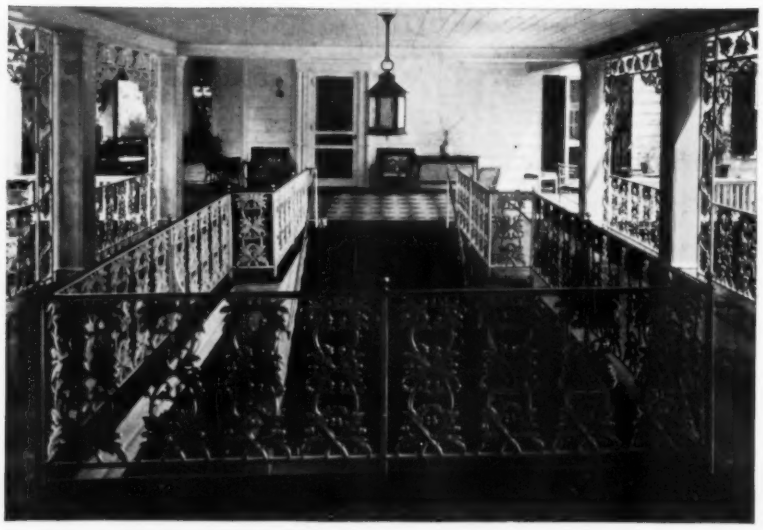
Lighting

Color and Colors, by Dr. Matthew Luckiesh. Editorial Service Bureau, General Electric Co., Nela Park, Cleveland, Ohio. Price, $3.

General

Interior Architecture and Decoration (A Working Bibliography for the Professional Decorator, Designer, and Architect). American Institute of Decorators, 30 Rockefeller Plaza, New York, N. Y. Price, $1.

SMYSER-ROYER CAST IRON VERANDAS



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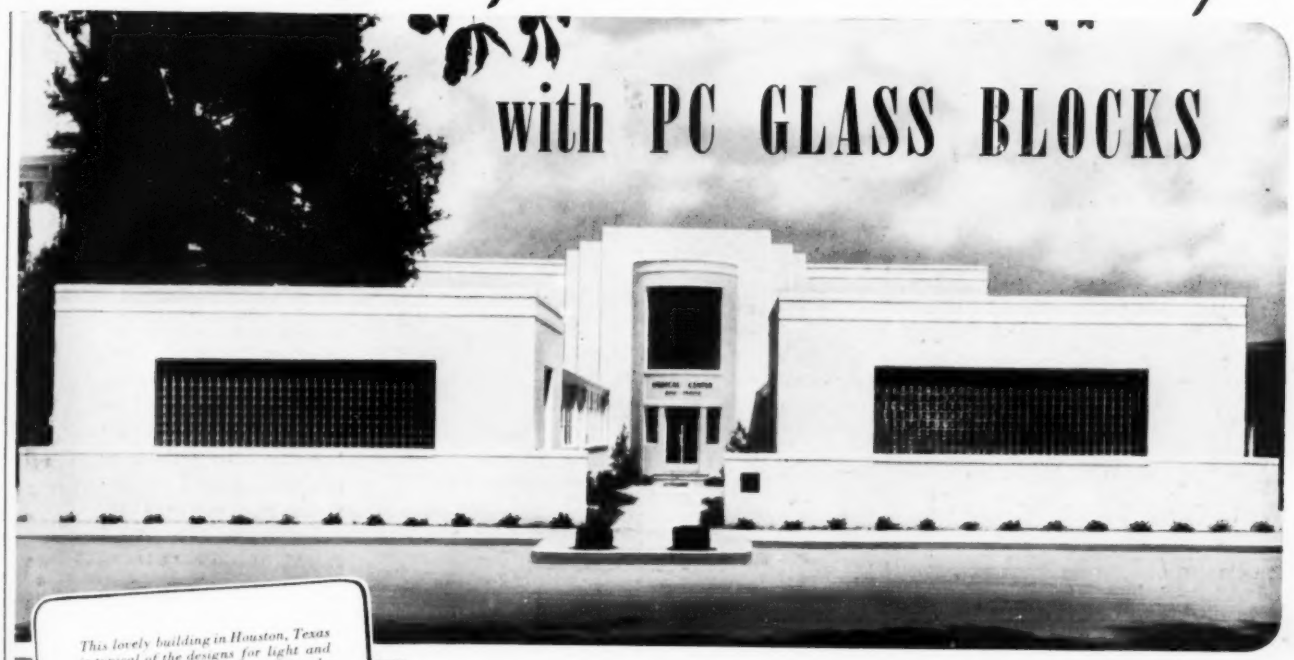

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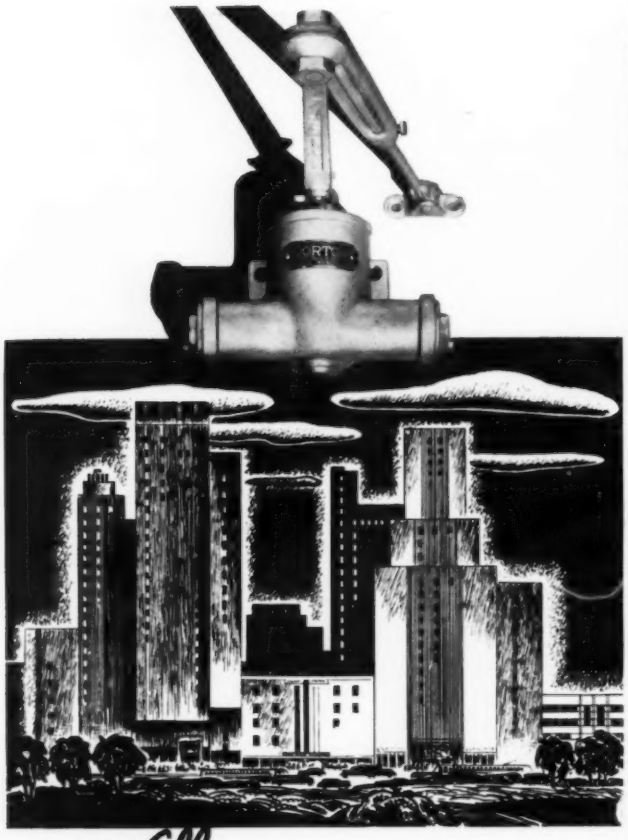

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Speakman Showers and Fixtures are easy to install—render efficient, *lasting* service. Customers appreciate their beauty and utility—plumbers and architects appreciate their workmanship and faultless operation.
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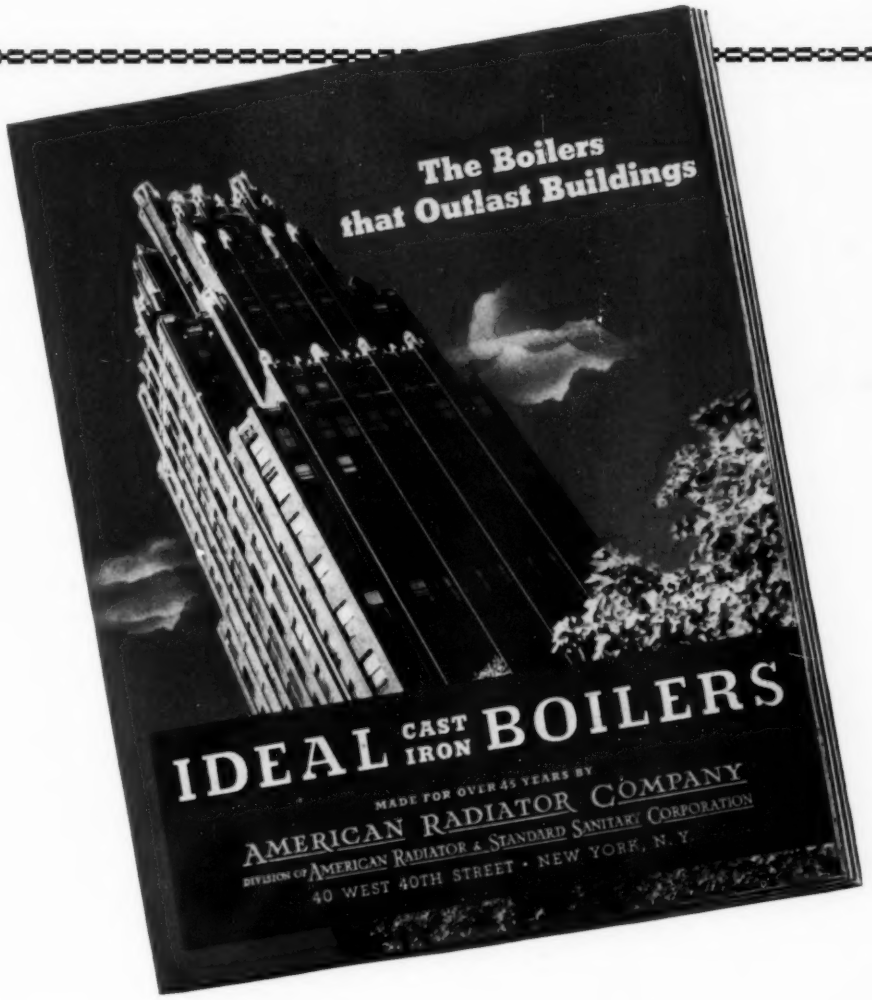
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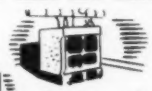
There's more to a boiler than appears on the surface. And this book tells the "inside story." It's full of interesting facts about the boilers that outlast buildings. Boilers that are easily and quickly installed. Boilers that cut space-waste.  Boilers that reduce operating costs in several ways. Boilers that are ideal for big buildings —of all kinds. For a copy by return mail, just jot your name and address in the margin of this page or on a card and mail it today to Dept. AR-12.

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And at Hotel Cleveland, all the city is at your doorstep. All five buildings of the Terminal development under the same roof; stores and office buildings to the east; government buildings north; wholesale district west; industrial plants south. And comfort, friendliness, welcome, *at home* — in your room and all about you in

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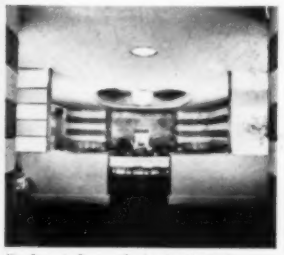
WITH NEW G-E FLUORESCENT MAZDA LAMPS

This striking modern fixture uses four exposed 20-watt Daylight Fluorescent MAZDA lamps.



Both pink and daylight Fluorescent MAZDA lamps light "Fan and Bill's" at Glens Falls, N. Y.

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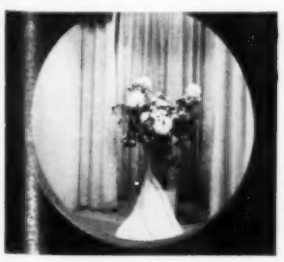
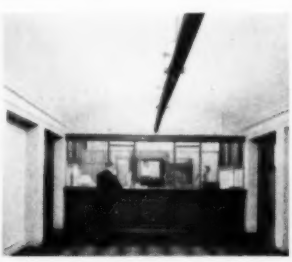


Because these lamps are 50% cooler they lend themselves to installations where heat must be avoided.



Fluorescent lamps can be used for indirect lighting by using an inverted trough.

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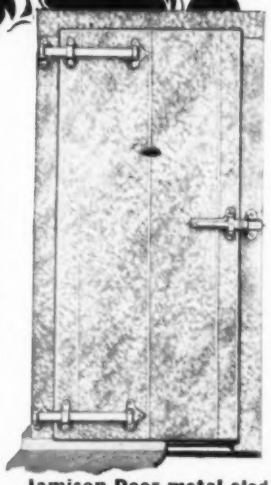

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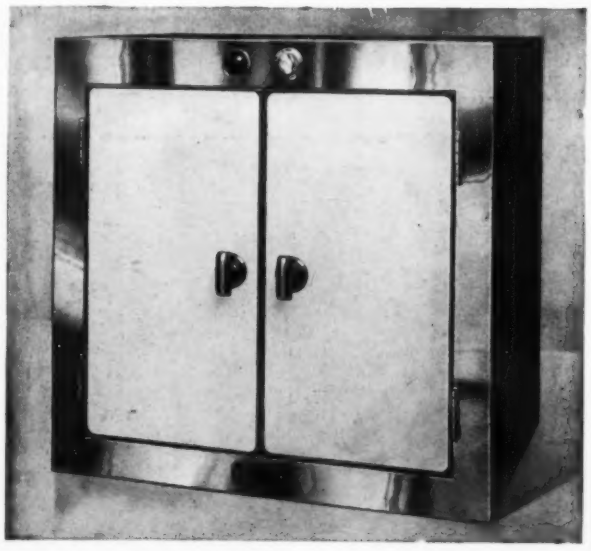

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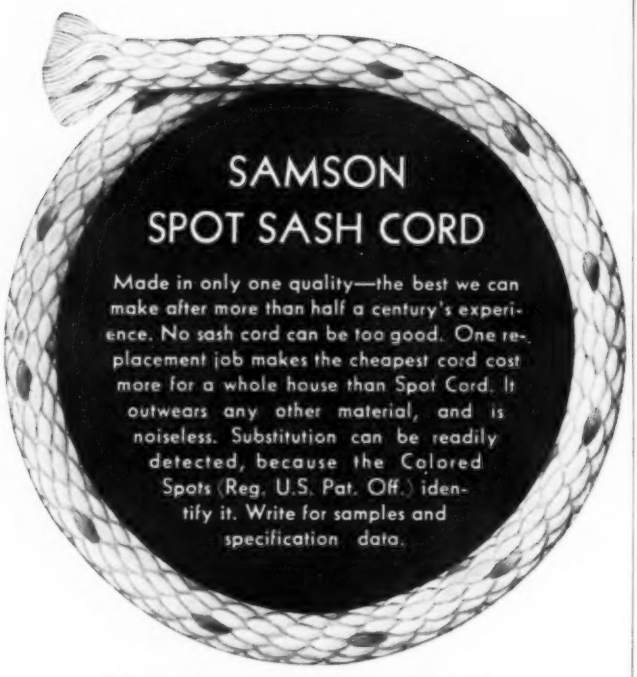

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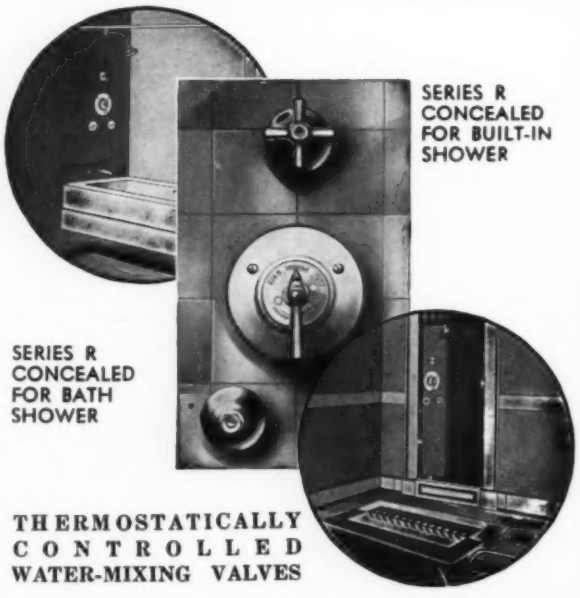

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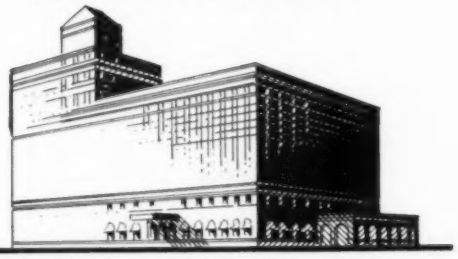

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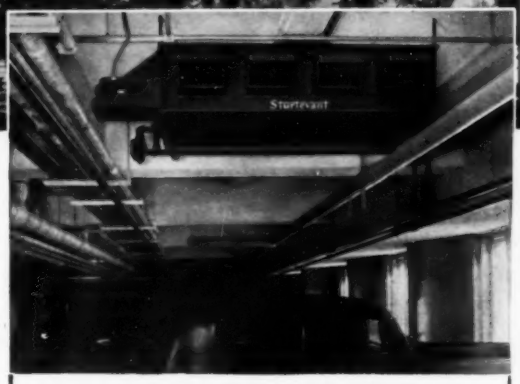

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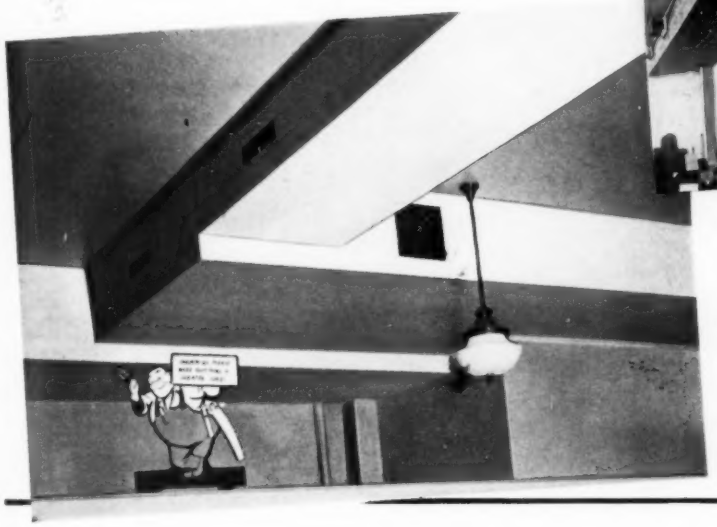

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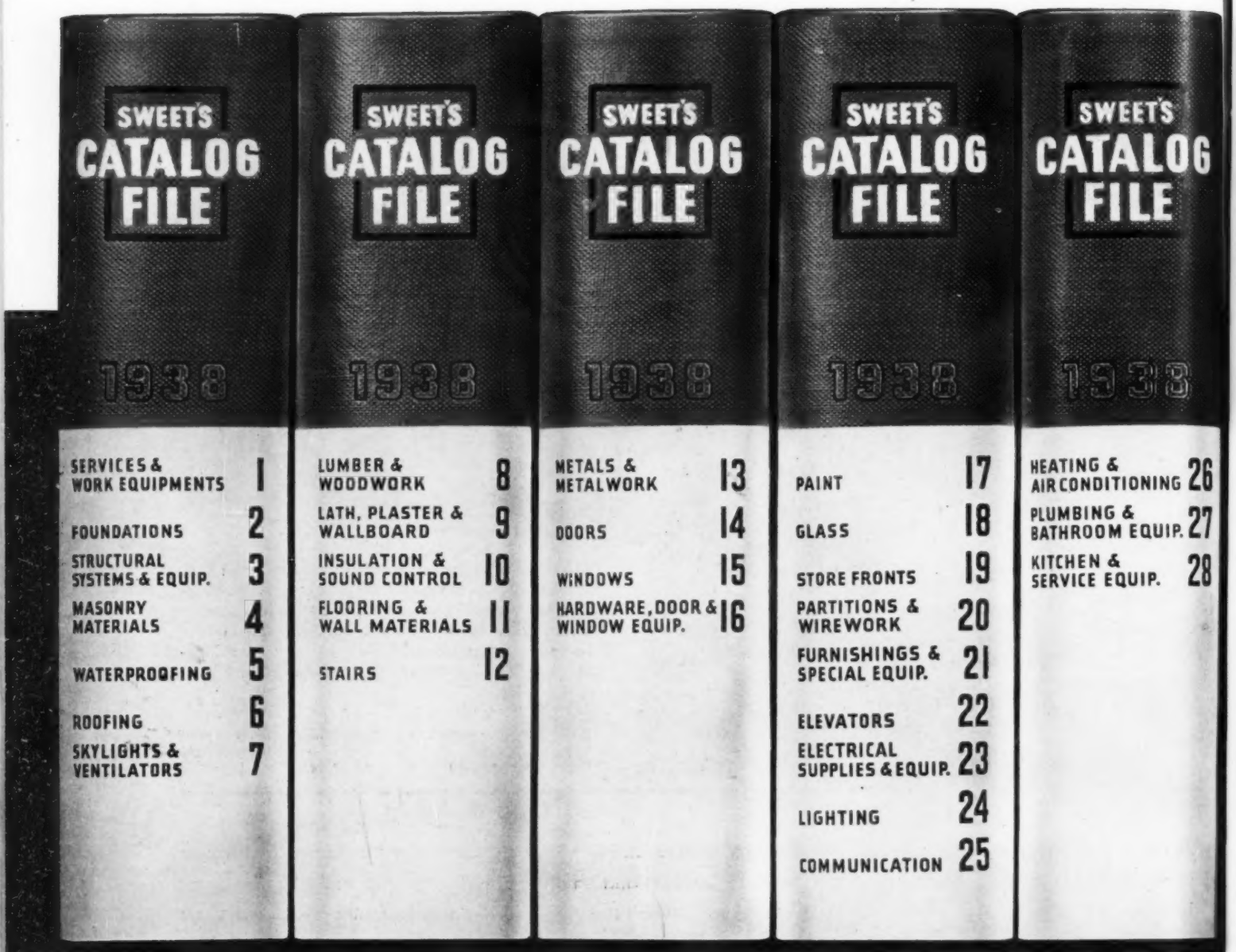

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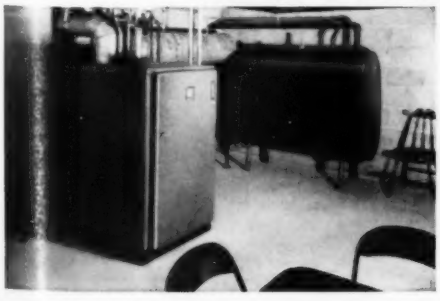

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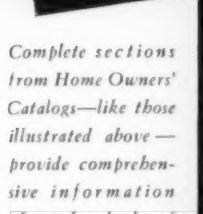

Complete sections from Home Owners' Catalogs—like those illustrated above—provide comprehensive information about hundreds of reliable products regularly specified by architects.

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American Brass Company
American Lumber & Treating Co.
American Radiator Company
Andersen Corporation
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Armstrong Cork Company
Bartlett Tree Expert Co., F. A.
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Burnham Boiler Corporation
Carey Company, The Philip
Chambers Distributing Co., Inc.
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Columbia Metal Box Co.
Crane Co.
Curtis Companies Incorporated
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Delco-Frigidaire Conditioning Division General Motors Sales Corp.
Detroit Steel Products Company
Donley Brothers Company, The
Douglas Fir Plywood Association
Excel Metal Cabinet Co., Inc.
Fitzgibbons Boiler Company, Inc.
Florida Louisiana Red Cypress Co.
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Streamline Pipe & Fittings Division Mueller Brass Co.
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Waterman-Waterbury Co.
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Western Pine Association
Wyman's Framingham Nurseries

Combinations of the above firms catalogs are included in each edition of Home Owners' Catalogs

AMONG THE PLEASANT EXPERIENCES of busy architects are those oft recurring situations which prove the value and helpfulness of *Home Owners' Catalogs.*

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HOME OWNERS' CATALOGS will be sent by mail, prepaid, and without cost of any kind, to those who qualify for ownership. See restrictions.

Published by F. W. Dodge Corporation, 119 West 40th St., New York, N. Y.

RESTRICTIONS—Home Owners' Catalogs will be sent only to owners who plan to build homes for their own occupancy, within 12 months, east of the Rocky Mountains, costing $4000 or more for construction, exclusive of land. EVERY APPLICATION WILL BE VERIFIED BY A DODGE REPRESENTATIVE.

AR-12-38

F. W. DODGE CORPORATION, 119 West 40th Street, New York, N. Y.

In accordance with these restrictions, please send a copy of Home Owners' Catalogs to:

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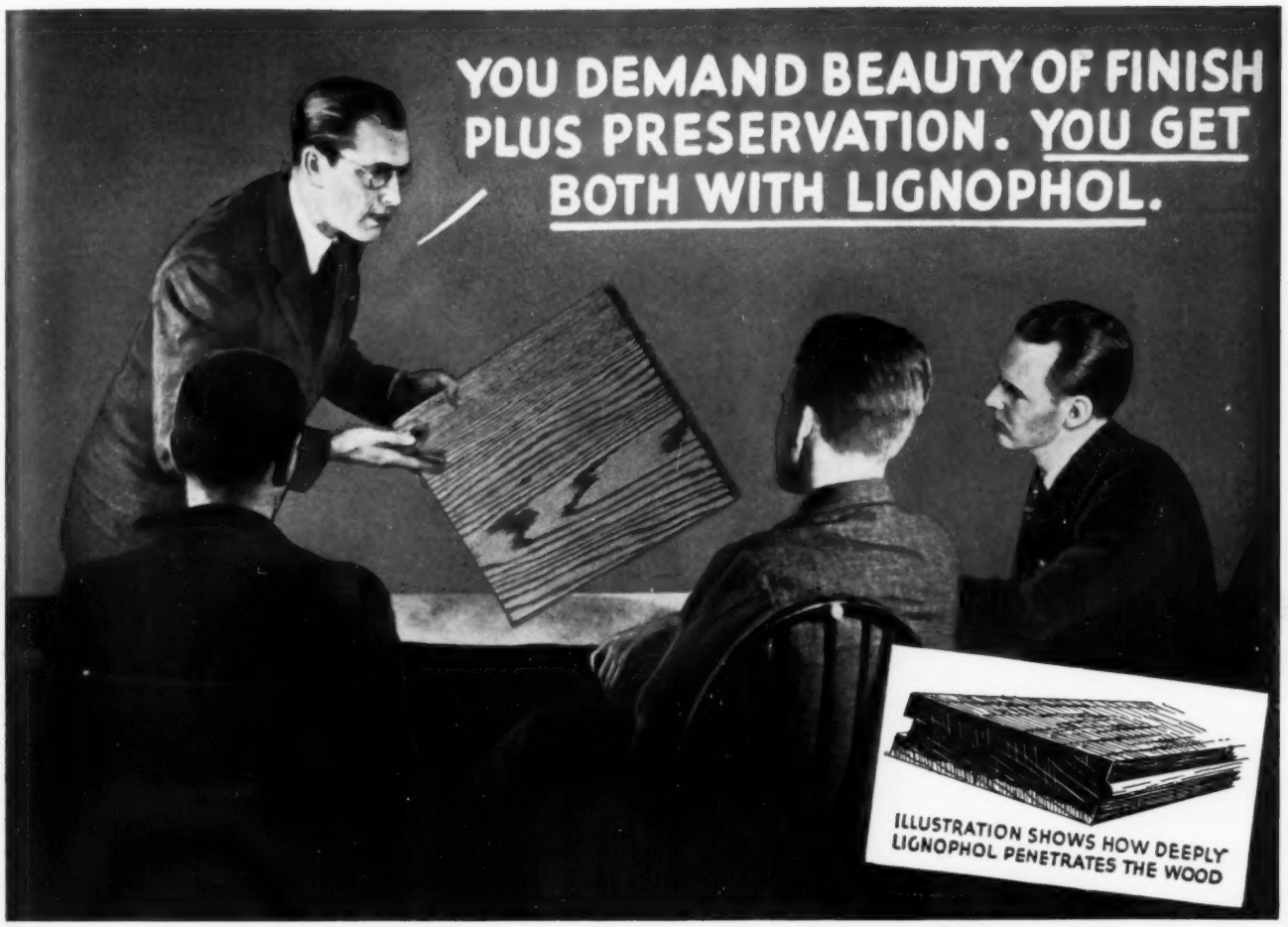
City ..... State .....

Signed ..... Architect, of .....


YOU DEMAND BEAUTY OF FINISH PLUS PRESERVATION. YOU GET BOTH WITH LIGNOPHOL.
ILLUSTRATION SHOWS HOW DEEPLY LIGNOPHOL PENETRATES THE WOOD

Wood floors will have a lasting finish *Plus* permanent preservation with *Lignophol*

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LIGNOPHOL ***will give a durable, attractive finish and at the same time protect against:***

WARPING • WET AND DRY ROT CRACKING, SPLINTERING, PITTING WOOD FLOORS • TRACKED-IN MUD AND WATER • MARKING AND BURNING FROM RUBBER SHOES

See the center panel for a few more of the many reasons—why you will want to specify LIGNOPHOL, the natural wood preservative and finish.

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Our Job would be EASY if...

Architects would insist upon Mesker Steel Sash with

Genuine Wrought Iron Sills

in every new building they build.

IT'S no fun to spend $10.00 or more per sash to replace rusted out sills in order to lease a building when we know that for as little as 10c more per foot originally we could have windows that would last the life of the building.

TODAY architects throughout the country are specifying Mesker Steel Sash with G. W. I. sills for all types of industrial, monumental and public buildings because they do appreciate the advantage of a window that will last the life of the building.

A copy of the booklet "Mesker G. W. I. Sills" will give you complete information and will be mailed promptly upon request.

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SINCE 1879
MESKER BROS., 424 S. SEVENTH ST., ST. LOUIS, MO.

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WITH RECORD ADVERTISERS

Advertising copy

WHEN we say we want to see better advertisements in the RECORD, the comment—from subject, through predicate, to object—is filled with self-interest. Good advertisements, especially in the building field, are an essential part of a good magazine. The advertising content should supply building designers with information which rounds out that supplied by the editorial content. If both advertising content and editorial content are of a high caliber, the combination—i.e., the magazine—is outstanding.

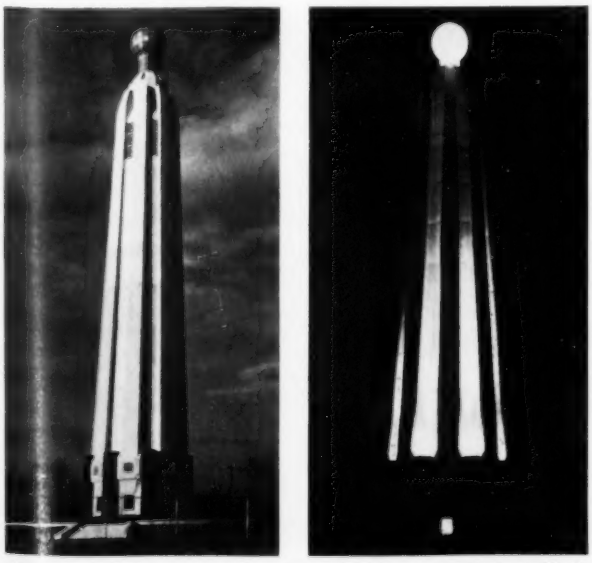
Because of several factors, the advertising writer in this field can ply his trade with fewer restrictions than he has to work under in others. First, he can take for granted a high degree of voluntary interest on the part of readers in what he is going to say. (Information is the stock in trade of building designers. They'd be shortsighted indeed not to add to their supply at every opportunity.) Second, the advertising writer can be as technical in his expression as the situation demands. (His readers know building nomenclature as well as he, and he doesn't have to waste space and energy "translating.") Third, his readers have an active interest in good layout, intelligent presentation, form, etc.

All in all a magazine with a readership such as offered by the RECORD should challenge an advertising designer to the utmost. It should almost represent a holiday.

Though current advertisements of building products show great improvement over those of a decade ago, the subject is by no means closed. Not all advertising writers approach their task from the building designer's—the reader's—point of view.

Building designers read advertisements in order to keep posted on what materials, equipments, and services are available for meeting the *performance requirements* of today's buildings. Advertisements which show quickly and clearly the relationships of given products or services to given *performance requirements* are obviously more efficient than those of a general or indirect character.

To make this point more comprehensible, we reproduce above a "double-truck" advertisement from last month's RECORD. For each of the three products stressed, there is a headline informing the reader instantly of that product's relation to building performance requirements. One reads: "When deflection is the governing factor"; another: "When ducts carry conditioned air"; and another: "When the aim is fire-safety in light-occupancy structures." These headlines are direct and to the point. They take the short-cut to a building designer's consciousness. The illustrations are equally well-handled. The fact that the presentation occupies the unit formed by two facing pages is also worth noting. Since there is no competition, the reader can give the copy his undivided attention—an advantage not to be ignored in an increasingly competitive world.



Day and night views, the Edison Memorial Tower, Menlo Park, N. J. Archts.: Messinna & du Pont, Wilmington, Del. Genl. Ctr.: Walter Kidde, New York. Calking by Ev-Air-Tight Calking Co., Phila., Pa.

For BETTER Weather Protection

CALK all Joints WITH PECORA COMPOUND

THE Edison Memorial Tower is representative of the present day practice of calking all masonry joints with Pecora. While, for some years, it has been customary to calk all window and exterior door frames, even greater weather protection is now obtained by the use of Pecora Calking Compound for pointing up stonework and sealing *every* exposed joint. Pecora Calking Compound has demonstrated its dependability for 30 years. Properly applied, it will not dry out, crack or chip. May we send you complete data?

Write for New Folder

Pecora Paint Company, Inc.

Member of Producers' Council, Inc.
Established 1862 *by Smith Bowen*
Second St. & Erie Ave. PHILADELPHIA

ALSO MORTAR STAINS • SASH PUTTIES • ROOF COATING • PECOMASTICS FOR STRUCTURAL GLASS INSTALLATION

Show your clients how Monel cylinders look after more than twenty years' hard use

YOU'LL doubtless agree that Monel can *take* it all right. In fact, you already know that nothing but Monel can possibly show such enduring performance as this. Picture any but a Monel washer still on the job after twenty solid years! And think of your client's saving on repairs and replacements—his freedom from trouble and annoyance—with equipment made of durable, lasting Monel.

But that's only half the story. And the second half is of even more interest. For while long life and freedom from wear and corrosion are mighty important, Monel washers offer other big advantages:

1. Cleaner washes. 2. No snagged and torn fabrics. 3. Greater production with lower operating costs. The reasons? First: Cleaner washes because Monel cylinders have more than twice as much open area. And Monel stays clean because it doesn't rust, chip or peel—neither does it absorb soap, grease odors, or dirt. Second: Snagged and torn fabrics are eliminated, because hard, tough Monel retains its hard, smooth surface year in and year out. Third: Production is increased and operating cost lowered because Monel washers handle more washes in less time, in less space—with less water, power, steam and supplies. Production has been more than doubled in some laundries, with no increase in labor costs.

By specifying Monel washers you assure your clients greater satisfaction. And because extractors, table tops, pails and starching equipment handle the same garments and fabrics, they, too, should be rust proof, resistant to corrosion, wear and roughness—and so made of Monel. Write for further information. Address:

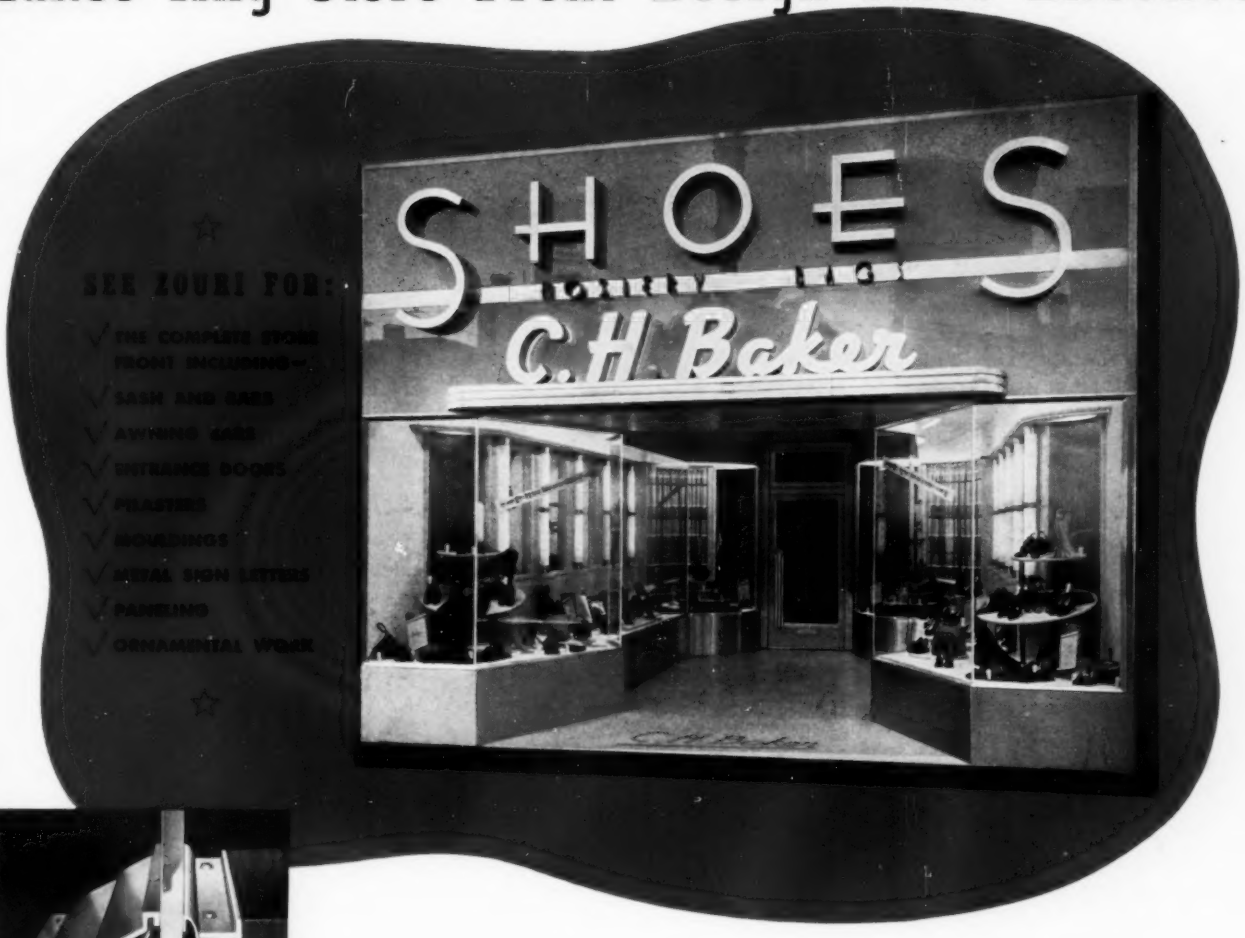
WE ARE CO-OPERATING
BETTER HOUSING PROGRAM

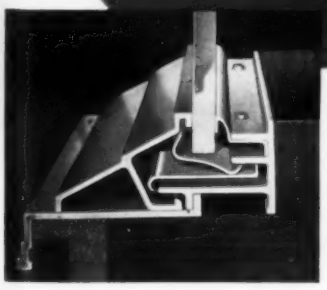
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street **New York, N. Y.**

"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.

LIBERAL USE OF RUSTLESS METAL

Makes Any Store Front Design More Effective





Glass Protection

To be safe, plate glass must be handled and HELD with care! That's why the new ZOURI Extruded Sash and Bars as well as the famous Rolled Safety Key-set construction are designed to provide FULL CUSHION GRIP on glass. This important feature assures maximum protection against the danger and expense of glass breakage — protection vital to the satisfaction of owner and merchant.

Important to architects and builders is the modern demand for more attractive store fronts. That's why store front designers are turning to the liberal use of ZOURI Rustless Metal — for its life and lustre, for rich lasting beauty, and for interesting lines and contrasts.

Zouri offers a complete line of store front construction in either rolled or extruded metal. In most cases striking effects may be obtained by the use of standard sections, which are carried in stock. In others, ZOURI fabricates special architectural metal work in aluminum, bronze or stainless steel—to face the entire front with modern metal, to produce doors or metal letters in harmony with the store front design, or to satisfy any modern demand. A 14-page catalog is at your disposal in SWEET'S. See your ZOURI distributor or write direct to ZOURI STORE FRONTS, NILES, MICH., for full size details.

ZOURI STORE FRONTS

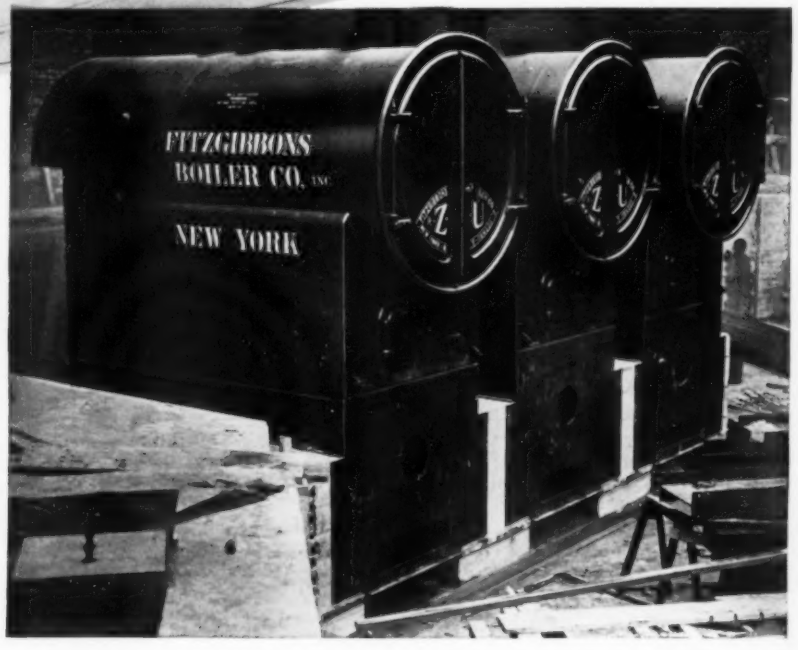
(TABLE OF CONTENTS ON PAGE 5)

THE NEW Y.M.C.A. BUILDING, HARTFORD, CONN.

The new Physical Department Building of the Hartford, Conn., Y. M. C. A. Architect, Carl J. Malmfeldt. Consulting Engineer, Paul D. Bemis.

Three Fitzgibbons R-Z-U Boilers will heat the building. Shown just after their installation by T. G. Shaffer, Inc., heating contractor.

Attractively designed and efficiently heated



FITZGIBBONS STEEL BOILERS

Provide mighty sound "heat insurance" in any building. Look at the three good reasons why the Hartford Y. M. C. A. expects efficient heat and plenty of it, in their new building—three sturdy, upstanding Fitzgibbons R-Z-U Boilers all set to work in close harmony with the oil burners they are ready to receive. Three of a kind, designed *right* for oil burning, *right* for speedy heating, *right* for the fuel-saving economy for which Fitzgibbons Steel Boilers are famous.

Architects who wish to insure this brand of heating satisfaction in the buildings they design, will find the boilers they need in the Fitzgibbons line, and willing engineering cooperation to aid in their selection.

Fitzgibbons R-Z-U Boilers are built in types for oil, gas, stoker, and hand firing. Their long flue travel and positive water circulation give them an ideal combination of fuel economy with quick steaming.

Keep the R-Z-U Catalog — mailed at request — on file for ready reference. In any specific job, check with your local Fitzgibbons engineer. Write us.

MOST ECONOMICAL IN FUEL — 1856 — THE FITZGIBBONS BOILER

Fitzgibbons Boiler Company, Inc.

General Offices: ARCHITECTS BUILDING, 101 Park Ave., NEW YORK, N. Y.
Works: Oswego, N. Y. *Branches & Representatives in Principal Cities*

FOR FURTHER INFORMATION SEE OUR CATALOG IN SWEET'S

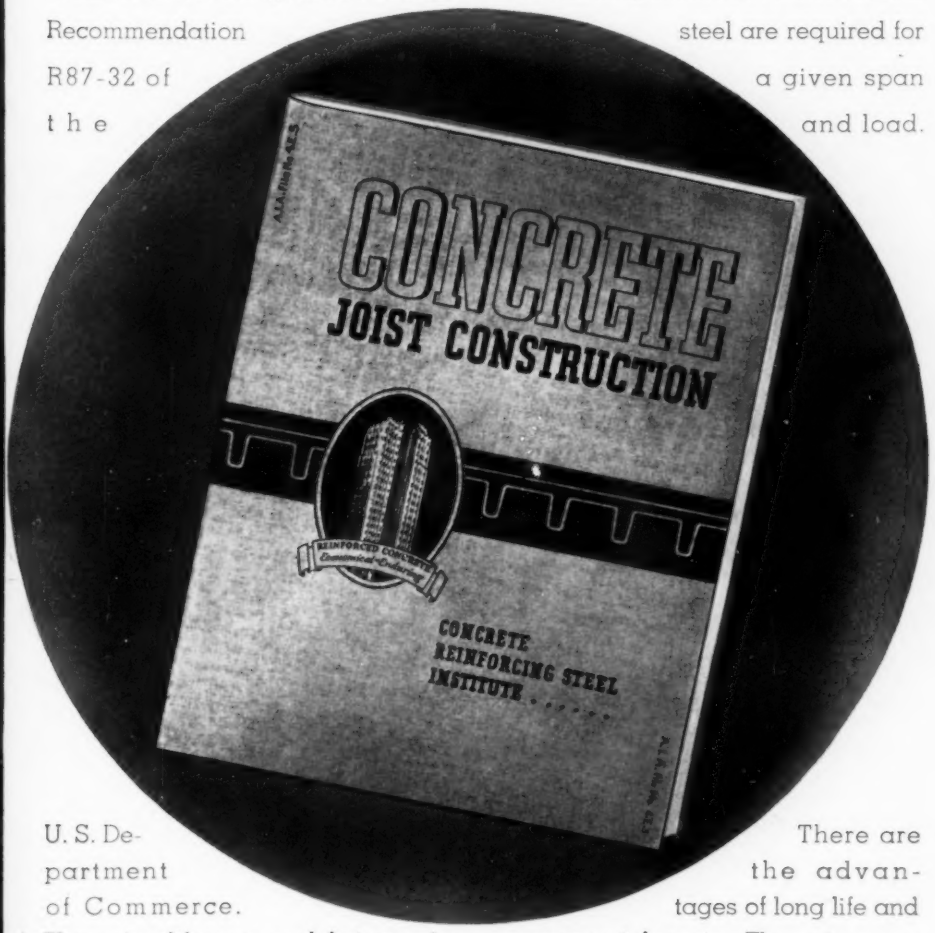
ARCHITECTURAL RECORD, combined with AMERICAN ARCHITECT AND ARCHITECTURE, is published monthly by F. W. Dodge Corporation, 115-119 West 40th Street, New York. $3 per year; Foreign, $5. Reentered as second-class matter March 31, 1938, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Vol. 84, No. 6, December, 1938. Copyright, 1938, by F. W. Dodge Corp. All rights reserved.

STANDARDIZED

● Standardization is one important reason why so many architects today are specifying Concrete Joist Construction. Standardized forms are universally obtainable in standard widths and depths in accordance with Simplified Practice Recommendation R87-32 of the U. S. Department of Commerce. They simplify use and bring substantial savings in time and labor.

The Handbook illustrated here contains standard specifications, and design load tables. It is usable, workable data, clearly presented and easy to apply!

Concrete Joist Construction has many distinct advantages, applicable to any type of structure. This modern method embodies important savings in time, labor, and material because minimum quantities of concrete and steel are required for a given span and load.



There are the advantages of long life and permanent beauty. There is more than adequate fire protection.

In a modern residence—or a skyscraper — you will find Concrete Joist Floor Construction satisfactory from every standpoint.

Send for your free copy of the Handbook, "Concrete Joist Construction."

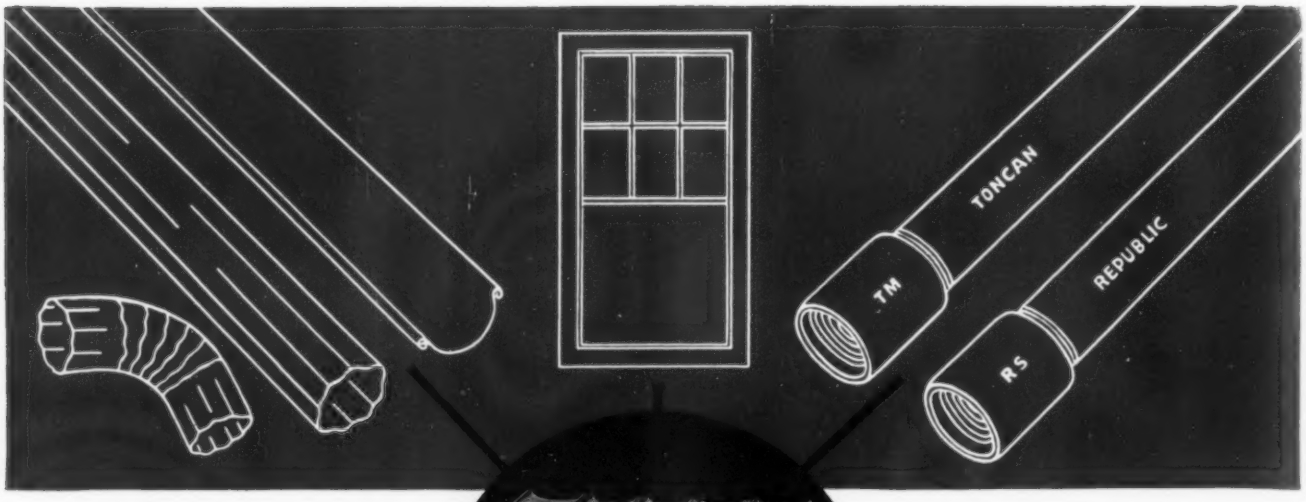
CONCRETE REINFORCING STEEL INSTITUTE

Builders Building, (Department 112), Chicago, Illinois

Forms Department Members:

Hugh J. Baker & Company . . . Indianapolis, Ind.
Ceco Steel Products Corporation . . . Omaha, Nebr.
Colorado Builders' Supply Co. . . . . Denver, Colo.
Concrete Steel Company . . . . . New York, N. Y.
Donley Brothers Company . . . . . Cleveland, Ohio
Goldsmith Metal Lath Company . . Cincinnati, Ohio
Hausman Steel Company . . . . . Toledo, Ohio
National Concrete Metal Forms Corp., Newark, N. J.
Steelform Contracting Co. . . . San Francisco, Calif.
Truscon Steel Company . . . . . Youngstown, Ohio

CONCRETE JOIST CONSTRUCTION

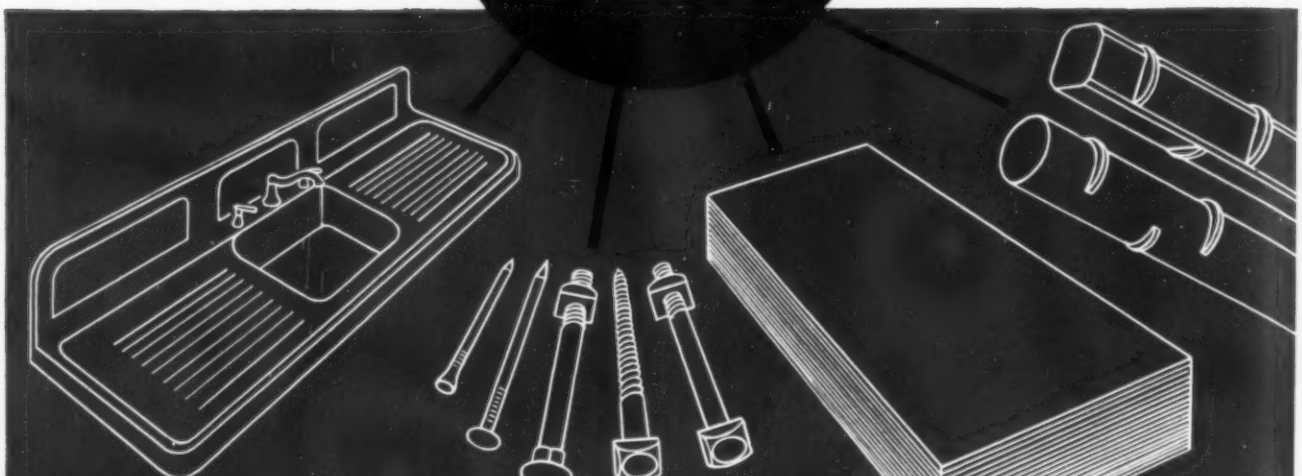


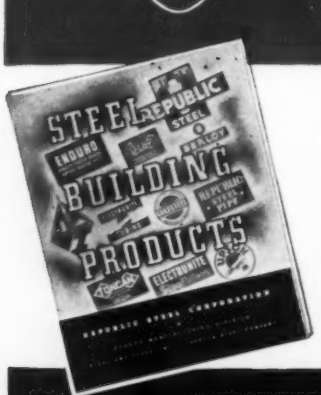
TIME SAVING

information for you at your finger tips

MONEY SAVING

steels and steel products in local stocks





To help you design and erect better building structures of every type, Republic and its divisions and subsidiaries listed below produce the most complete line of steels and steel building products available. And Republic stakes its reputation as a producer of fine steels on the quality of every item in the line.

To save you time, Republic includes complete information on its building products in Sweet's Catalog File and in Booklet No. 196—places detailed data at your finger tips—and is ready to furnish further information or to answer your specific questions promptly. When you need additional details, write Republic Steel Corporation, Cleveland, Ohio.

REG. U. S. PAT. OFF.
REPUBLIC STEEL

REPUBLIC STEEL

BERGER MANUFACTURING DIVISION • STEEL AND TUBES, INC.
TRUSCON STEEL COMPANY

In the Administration Building of the Moody Bible Institute, Chicago, Illinois . . .
Corrosion study showed—
33 CORROSIVE SERVICES
3 APPLICATIONS FOR BYERS WROUGHT IRON
An Example by
THIELBAR & FUGARD
Architects, Chicago, Ill.

The *engineering approach* to the problem of piping selection was used again in the Moody Bible Institute, Chicago. Experience predicted corrosive conditions in (1) Hot and cold water lines; (2) Cold water storage tank; and (3) Surge tank. Experience recommended Wrought Iron as the best material to combat such corrosion.

The importance of proper piping selection is emphasized by the high cost of premature failure. The wide variety of corrosive services involved, and the wide variety of materials offered to combat them, makes selection an *engineering problem*.

We have helped many architects and engineers to select materials on an engineering basis. We will gladly help you. If you will write, outlining your problem, our Engineering Service Department will determine the probable corrosive conditions; relate these to similar conditions encountered elsewhere; interpret the results in terms of experience gained in over 70 years' contact with corrosion problems, and make recommendations—backed by actual service records. Ask, too, for a copy of the bulletin, "Wrought Iron in Piping Systems." May we work with you?

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

BYERS
GENUINE WROUGHT IRON
Tubular and Flat Rolled Products

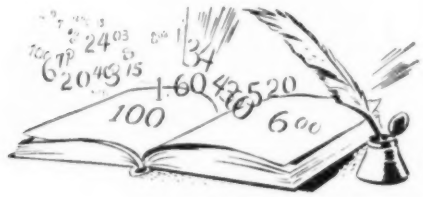
Specify Byers Genuine Wrought Iron Pipe for corrosive services and Byers Steel Pipe for your other requirements.

HERE'S PROOF

That America likes her Home Financing

WITHOUT RED TAPE!

FACTS This is the true picture of residential financing in the United States. Figures are from recent Federal Home Loan Bank Board reports.



FIGURES Total home mortgage loans made in 1937 by institutional lenders—$1,605,000,000.00.*

Here are the percentages:

Savings or Building and Loan Associations	55.82%
All Commercial Banks	22.08%
Mutual Savings Banks	8.24%
Life Insurance Companies	13.86%
Total	100.00%

*In addition, an estimated $475,000,000.00 was loaned by individuals and other non-institutional lenders to finance homes.

FILE *Put it down* for your record and your reference that America wants *red-tapeless* home financing *that's easy, friendly and safe!*

Put it down that *Local* Savings or Building and Loan Associations do 11.64% more home financing *than all other financing institutions put together!* They finance home loans at home! They give prompt service—release money without delay!

That is why they are recognized as the nation's most logical source of building money. And that is why they serve your interests best!

Your recommendation of this home financing service will benefit you because—"*When You Support Your Local Savings or Building and Loan Association—You Help Local Business!*"

Let members of the United States Building and Loan League (333 North Michigan Avenue, Chicago, Illinois), in your community help you to more business.

REALTORS—*when you put neighbors' savings to work financing neighbors' homes, you keep home dollars at home.*

Your Local SAVINGS OR BUILDING AND LOAN ASSOCIATION

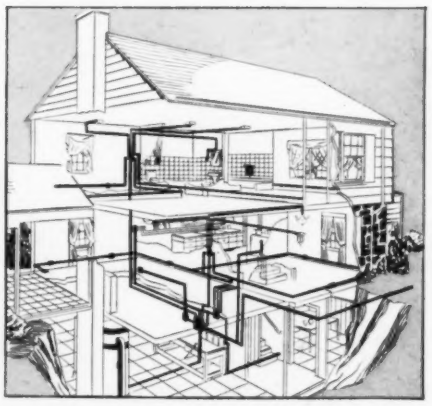
When you support **Your Local Savings or Building and Loan Association—*You help local business!***

EVERYTHING WE HAVE IS YOURS!

We mean it sincerely! The Home Bureau was created by General Electric as a clearing house to which architects may refer all their electrical problems. We do not furnish plans. But, our staff of experts will check *your* plans from an electrical point of view, and make suggestions concerning wiring, heating, air-conditioning, lighting, kitchens and laundries. We invite you to call on us, on your next job, and join the increasing number of architects who are availing themselves of this Free service.

STEP 1 Blueprints are reviewed by an experienced staff. Electrification of the entire house is planned so that your client may enjoy complete utilization of electrical servants.

STEP 2 Kitchen floor plans are studied. Layouts recommended. All efforts are directed toward adequate light, ventilation, well-planned work centers, correct placement of equipment.



STEP 3 Our engineers will suggest proper location of all outlets, and will make general recommendations for wiring systems so that clients may enjoy full benefits of electrical aids.

STEP 4 We will help solve automatic heating and air-conditioning problems—suggesting systems appropriate for specific houses and locations; placement of outlets and heating plants.

STEP 5 Builders and architects everywhere stress the importance of correct light. So does the Home Bureau. It stands ready to help *you* plan for today's and tomorrow's lighting needs.

To obtain this service, just mail your blue prints to the General Electric Home Bureau, 570 Lexington Avenue, New York City, and we will aid you in details of planning electrification of houses.

GENERAL ELECTRIC

GENUINE RED CEDAR SHINGLES
Weathered the Storm!

THE MOUNT WASHINGTON WEATHER OBSERVATORY, BUILT IN 1908.

Photo by Harold Orne.

Laboratory Test of Wind Resistance

A force of eighty-five pounds is required before a properly nailed Certigrade Shingle of average width can be pulled from a roof. This is real wind resistance.

Address the following for complimentary copy of the Certigrade Handbook of Red Cedar Shingles:

RED CEDAR SHINGLE BUREAU
Seattle, Wash., U.S.A. or Vancouver, B.C., Canada

Amazing Resistance to Storm Damage Reported

EYE WITNESSES who traveled the New England states in wake of the recent appalling storm report that Red Cedar Shingles have "stood up splendidly" . . . and in many instances when other types of roofing were ripped from the buildings, good old reliable Red Cedar Shingles remained intact.

Resist 200 Mile Gale on Mount Washington

AN OFFICIAL of the Mount Washington Railway Company writes: "The Observatory buildings are shingled on the exterior sides and roof with Red Cedar Shingles . . . The New England hurricane left the buildings at the summit unscathed despite a recorded five-minute average of 165 miles per hour of wind and an estimated gusty wind in excess of 200 miles per hour. At the same time, however, we lost 2,300 feet of track trestle at an estimated loss of $75,000."

FOR GUARANTEED GRADES AND QUALITY, SPECIFY—

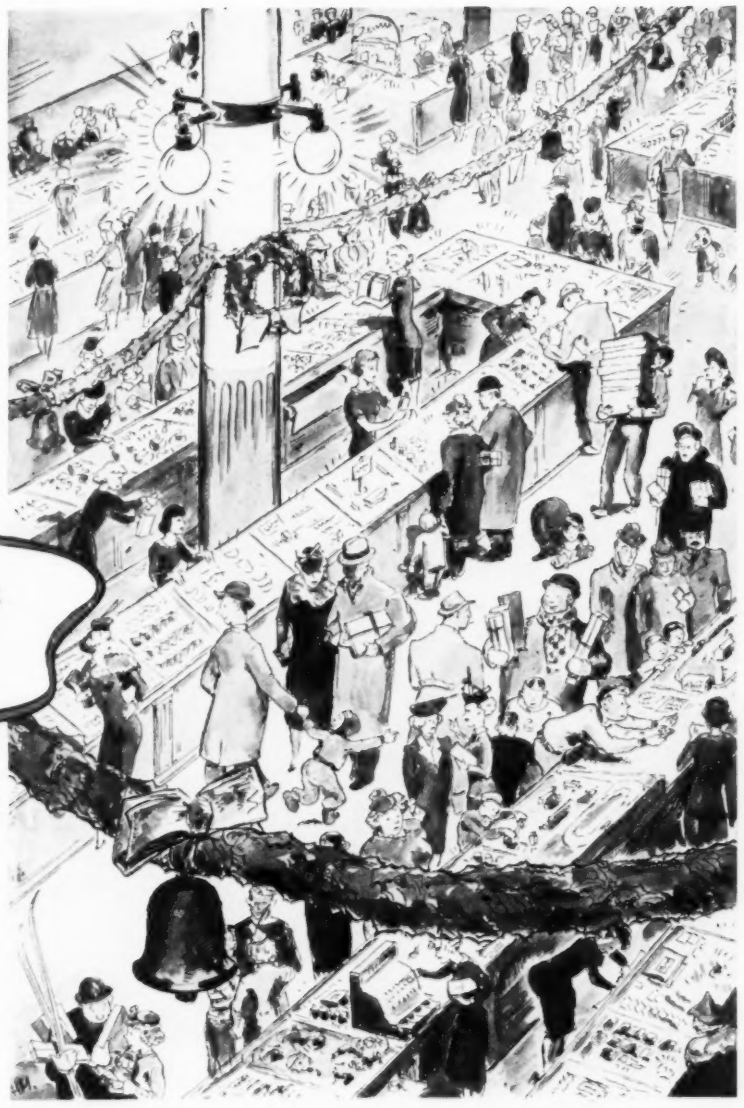
CERTIGRADE
Red Cedar Shingles

Certigrades Pass Official Inspection for Grade and Quality. U. S. Government Standards.

Sold only by Established Lumber Dealers.

. . . jammed with Christmas shoppers when the normal electric supply . . .

FAILED!



It's the first 60 seconds that count

"A POWER FAILURE occurred last year around Christmas, and lasted about 20 minutes. The Manager stated that there were more than 1000 persons in the store at the time. The Exide units took care of the situation perfectly until normal electric service was restored. He said that he is well-pleased with the equipment and feels that it has already paid for itself."

Imagine a chain store during the Christmas rush suddenly plunged into darkness, and you know how quickly the emergency lighting system must flash into action if disorder and danger are to be prevented. You are sure of both instantaneous and automatic protection with an Exide system. That is why you can specify and recommend these units with confidence for stores, schools, theatres, restaurants, hospitals and other buildings which must have unfailing light.

The utility companies take every precaution, but cannot control the effects of storms, floods, fires and street accidents. Privately-owned plants, no matter how carefully planned and operated, may also have interruptions that render Exide protection essential. These systems need no other attention than the addition of water four times a year. Send for Don Graf's Data Sheets giving full details.

1888 FIFTY YEARS OF ACHIEVEMENT 1938

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia

The World's Largest Manufacturers of Storage Batteries For Every Purpose

Exide Batteries of Canada, Limited, Toronto

To mark the fiftieth anniversary of Exide Batteries, a handsome souvenir booklet has been prepared, illustrating the essential part these batteries play in daily life. Write to us, and we will be glad to send you a free copy.

Exide
Keepalite
EMERGENCY LIGHTING SYSTEMS
$150 AND UP

Refer to Sweet's Catalogue, Section 23/22

Mail this coupon

The Electric Storage Battery Company
1908 W. Allegheny Ave., Phila., Pa.

Send me, without obligation, new bulletin and Don Graf's Data Sheets on Exide Emergency Lighting.

NAME _____

NAME OF FIRM _____

ADDRESS _____

I am an Architect ☐ Engineer ☐ Draftsman ☐

WHEN BETHLEHEM OPEN-WEB STEEL JOISTS ARE USED

Specifying Bethlehem Open-Web Steel Joists is a long step in the direction of greater fire-safety and lower depreciation in residences, apartments and other light-occupancy structures.

In combination with a concrete floor slab and a metal-lath-and-plaster ceiling Bethlehem Open-Web Steel Joists permit the economical construction of floors with a fire-resistance rating of better than two hours.

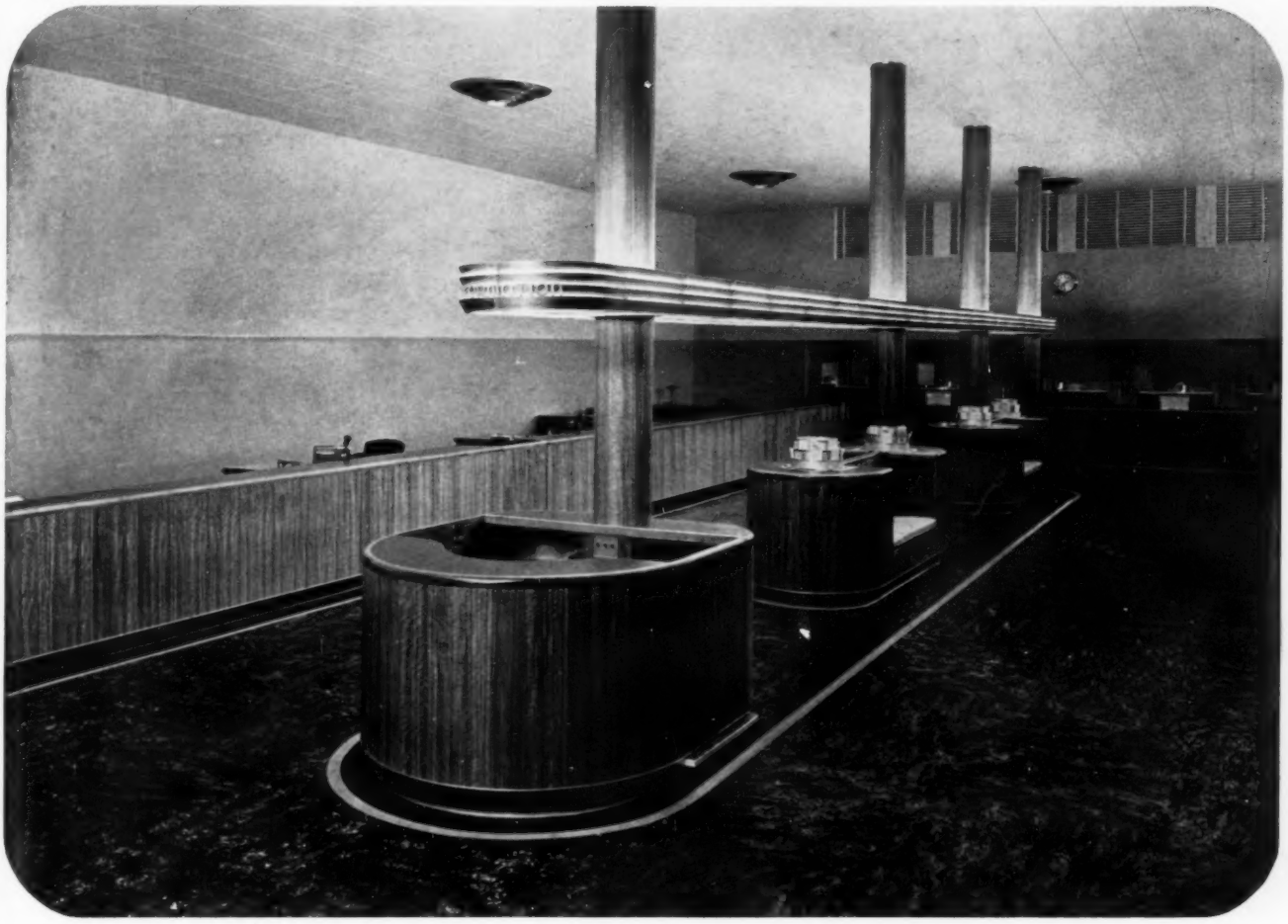
Furthermore, the freedom from shrinkage of Bethlehem Open-Web Joists prevents the development of unsightly cracks between floors and baseboards. Neither design nor erection are complicated by the use of Bethlehem Open-Web Steel Joists. As, in the lengths most generally used, they average only about 60 lbs. in weight; they may be easily placed by one or two workmen without special hoisting equipment.

Though Bethlehem Open-Web Steel Joists may slightly increase the cost of a structure, this is usually more than offset by reduction in maintenance and insurance charges.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

Functionally and decoratively . . . the ideal business office floor



FOR this commercial office, nothing but the most practical floor would do. A floor quiet and comfortable underfoot . . . with a perfectly smooth surface for easy cleaning . . . with built-in durability to give years of money-saving service under most punishing foot traffic. No wonder Sealex Linoleum was chosen!

And how beautifully the floor completes the decorative scheme . . . richly veined Sealex Veltone Linoleum, "streamlined" with contrasting Sealex Feature Strips and Borders.

On your next commercial contract, why not take advantage of the wide scope of design treatments in Sealex! There are 20 different colors of Sealex Veltone Linoleum alone, and 20 shades of Sealex Plain Linoleum.

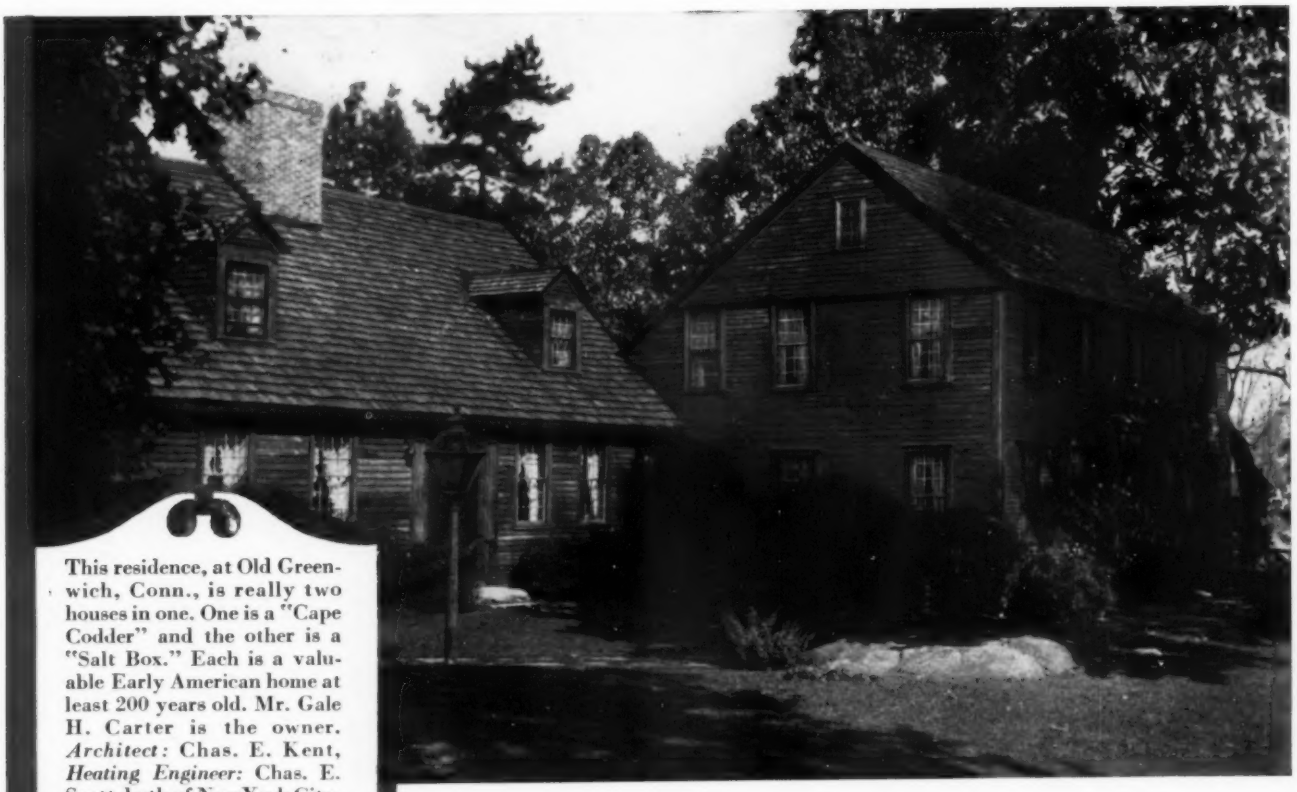
Installed by authorized contractors, Sealex Linoleum carries a guaranty bond fully covering materials and workmanship. Write for our architectural catalogue now!

CONGOLEUM-NAIRN INC., KEARNY, N. J.

SEALEX LINOLEUM

TRADEMARK REGISTERED

Floors and Walls



This residence, at Old Greenwich, Conn., is really two houses in one. One is a "Cape Codder" and the other is a "Salt Box." Each is a valuable Early American home at least 200 years old. Mr. Gale H. Carter is the owner. *Architect:* Chas. E. Kent, *Heating Engineer:* Chas. E. Scott, both of New York City.

Air conditioning is supplied by a "split" system, with approved Anthracite water-tube steel boiler and approved Anthracite stoker.

20TH CENTURY HEAT *in an* 18th CENTURY HOUSE

● Mr. Carter searched all New England for perfect examples of 18th Century American homes. He found not one, but two—bought them, transported them from their original sites to Old Greenwich, Connecticut, where they were re-erected as an harmonious residence. These rare and valuable examples of fine architecture deserved the best, safest, and most dependable heat. Mr. Carter states why he chose Anthracite:

> "I desired air conditioning to protect the rare old panelling and my antique furniture. I selected Anthracite as fuel because it is clean. I rejected oil because I don't like the dirtiness of oil smoke. It forms a film on the furniture, and furthermore, gets on the leaves of my old trees. Now that Anthracite can be handled conveniently and economically, it is much to be preferred."

When preparing plans for new homes or for modernizing old ones, remember that there were 7 reasons why Anthracite was selected as the fuel to heat this valuable, matchless architectural gem. With the whole field of heating fuels from which to select, the owner of this "perfect home" chose Anthracite. With Anthracite, as with no other fuel, you can provide your clients with all 7 essentials of heating satisfaction. The wide variety of modern Anthracite equipment is described in a book which we will be glad to mail upon request. Anthracite Industries, Inc., Chrysler Building, New York.

●

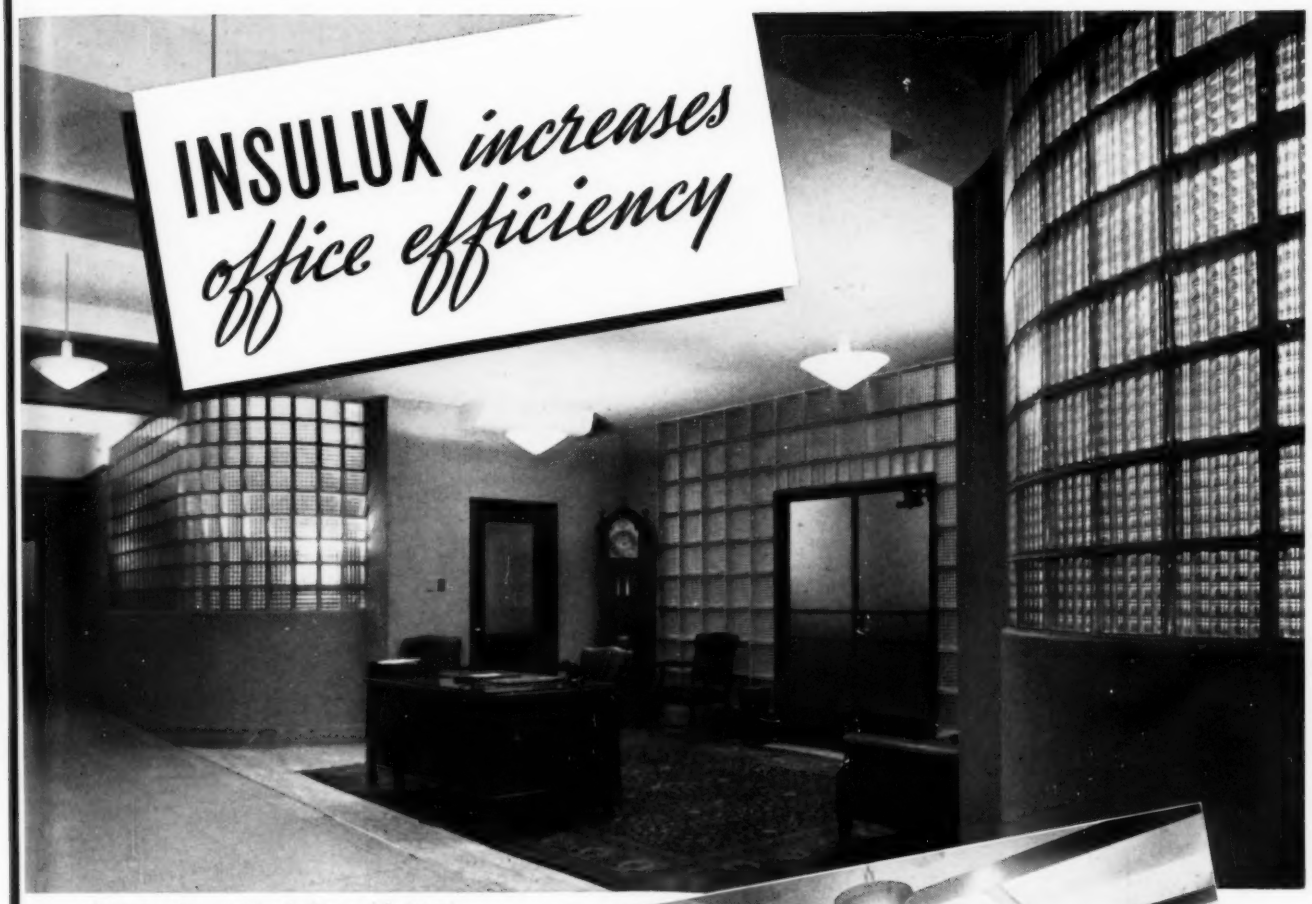
This Seal of Approval appears on Anthracite equipment only after it has passed the most rigid tests in the heating field.

ANTHRACITE INDUSTRIES INCORPORATED approved

Save with Pennsylvania ANTHRACITE (HARD COAL)

THE ONLY 7 STAR FUEL

INSULUX *increases office efficiency*



Reception Room, Fuller, Rodney and Redmond, New York City. A. G. Alexander, Architect.

Corridor, Fuller, Rodney and Redmond, New York City. A. G. Alexander, Architect.

● Brightness, Quietness, Dignity, Attractiveness and Privacy are important attributes of office buildings that use INSULUX to Light — the modern way. Owens-Illinois INSULUX does all the things expected of an office partition, and does them better. Because it transmits light, and at the same time deadens sound, corridors and hallways may be lighted with borrowed light without the usual high sound transmission. In many office buildings, this INSULUX feature has also reduced lighting costs considerably. INSULUX is easily cleaned, requires no decoration, increases rentability of property and it can be taken down and re-erected with a high percentage of salvage. These features, and others equally practical, make INSULUX Glass Block the ideal office building material. A wealth of structural data and case histories of successful office installations are available on your request. Use the coupon. Owens-Illinois Glass Company, Toledo, O.

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OWENS-ILLINOIS *"First in Glass"*

OWENS-ILLINOIS GLASS COMPANY
Insulux Products Division
310 Madison Avenue, Toledo, Ohio

Please send, without obligation, complete information about the use of Insulux Glass Block in commercial and industrial planning.

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City _____

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CONDENSATION can't attack the roof of this new air conditioned building

LEFT: NEW SERVICE BUILDING *of Detroit Edison Company, Detroit, Mich. Completely air conditioned, this building avoids condensation by use of Armstrong's Corkboard Roof Insulation. Architect, John C. Thornton of the Detroit Edison Company. General contractor, Walbridge-Aldinger Company.*

~ ~ ~

BELOW: LAYING ARMSTRONG'S CORKBOARD *over the concrete roof deck of the Detroit Edison Service Building. One-inch thickness was used over the high areas, 1½-inch over low. Large boards, 24" x 36", speed application. Roofing contractor, Robert E. Hutton Co.*

Armstrong's Corkboard insulates Detroit Edison Service Building to keep moisture from condensing

WHEN warm air comes in contact with a cool surface, moisture forms. This condensed vapor presents a danger because it is likely to damage unprotected roof areas of air conditioned buildings. That's why John C. Thornton, architect of the Detroit Edison Company, chose to insulate the roof of his Company's new Service Building in Detroit with Armstrong's Corkboard.

This efficient insulation helps to avoid a temperature drop between the outer and inner surfaces of the roof, thus preventing condensation. The tiny, still-air cells of which cork is composed effectively bar the passage of heat. Equally important, these cells resist moisture, and keep their efficiency through many years of service.

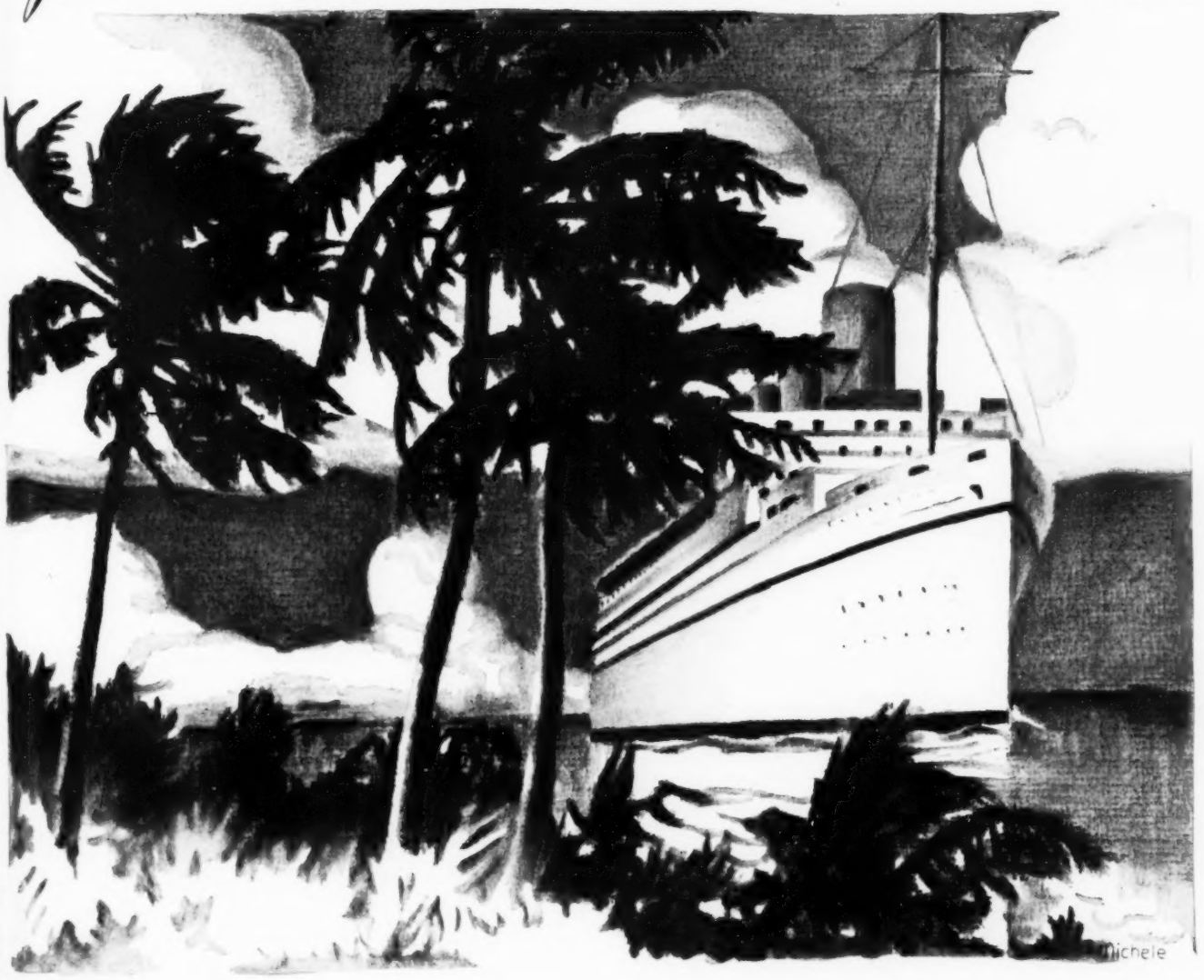
Armstrong's Corkboard and Cork Covering help to provide efficient, economical air conditioning in many of the country's leading buildings. On roofs, ducts, equipment, and cold lines, they prevent refrigeration waste and aid in controlling the temperatures that make for comfortable living, efficient work.

Write today for complete file data about Armstrong's insulation products for air conditioning. Address Armstrong Cork Company, Building Materials Division, 926 Concord Street, Lancaster, Pennsylvania.

Armstrong's CORKBOARD INSULATION

CORKBOARD - CORK COVERING - VIBRACORK

from the KOH-I-NOOR *Sketch Book*



"Some Fine Day . . ."

Maybe you've promised yourself "some fine day" to travel, or build a home in the country, or study Einstein's theory. Most workaday people, short of money or time, must necessarily be rather vague about the when and how of such projects. But sketching doesn't belong in that group; you can begin to enjoy its many pleasures right now, and can continue to do so for years and years to come. It is an old idea, but like most things that have lasted, it seems made to order for each succeeding generation. For us today it provides, at negligible expense of time or money, a means of self-expression highly effective in relieving the "rubber-stamp blues."

A broad, easily worked medium like the Koh-I-Noor compressed charcoal is especially satisfying. Ideas are quickly expressed or modified, and several studies of the same subject may be made without the tedium of working with a more difficult material.

Posters or other work in color should be studied in black and white first, to make certain that the value-combination is effective in itself. You can't go wrong if you do this; and Koh-I-Noor compressed charcoal is the ideal medium for such studies, giving off its tone freely and permitting ready changes with a kneaded eraser.

The drawing above was made with Koh-I-Noor compressed charcoal on charcoal paper. It may be considered a finished work in itself or merely a tonal study for a poster in color. Very little modelling was used, the stomp being applied carefully to give even tones or silhouettes. After the stomp had gathered sufficient charcoal dust, it was applied sparingly on the clouds and the steamer.

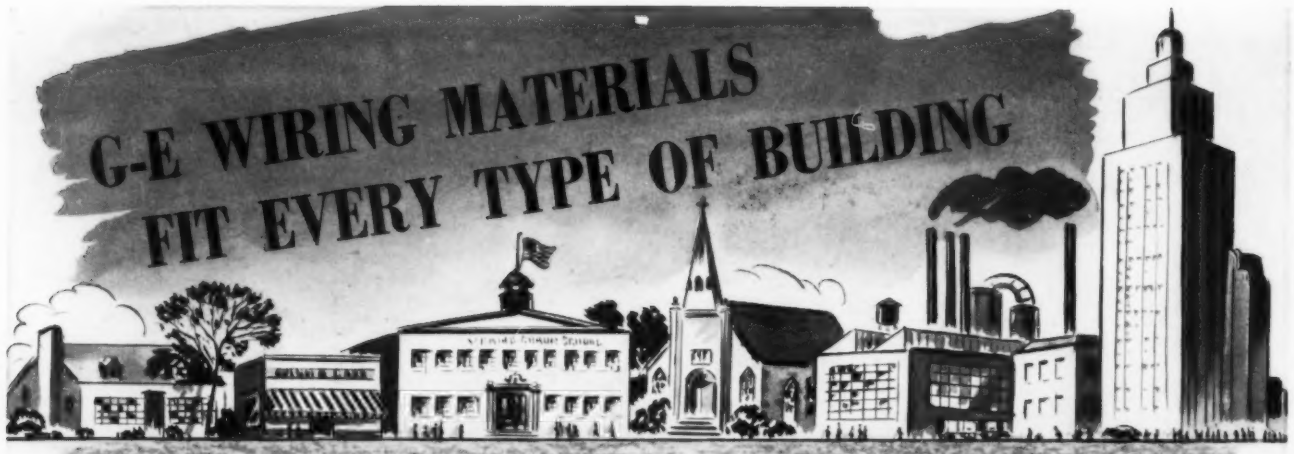
Julian Michele

KOH-I-NOOR *The Perfect Pencil*

NOW
10c *each*
$1.00 *the dozen*

Koh-I-Noor Pencil Company Inc. 373 Fourth Avenue, New York

G-E WIRING MATERIALS FIT EVERY TYPE OF BUILDING



G-E White Conduit

G-E BX Armored Cable

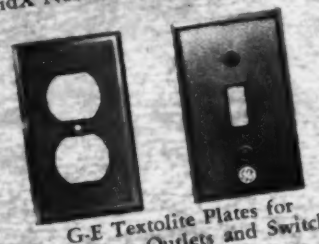
G-E Electrical Metallic Tubing

G-E Boxes and Fittings

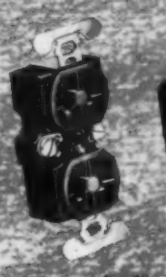
G-E BraidX Non-metallic Sheathed Cable

G-E Building Wire

G-E Branch-circuit Circuit Breaker



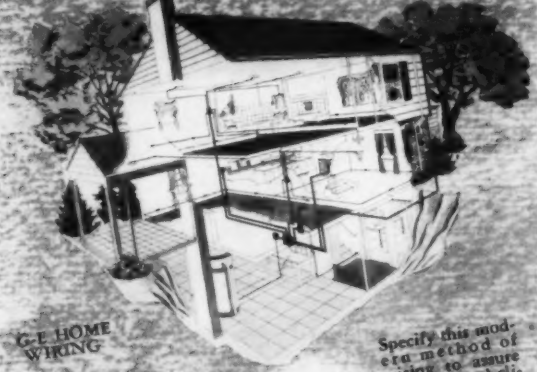
G-E Textolite Plates for Convenience Outlets and Switches



G-E Convenience Outlet

G-E Heavy-duty Switch

G-E Sphinx Mercury Switch



G-E HOME WIRING

Specify this modern method of wiring to assure adequacy and client satisfaction.

ADEQUATE WIRING SERVES AND SAVES

Whether you are designing a skyscraper or a one-story cottage, a large factory or a community theater you'll find exactly the wiring materials in the G-E line which are needed for the electrical system. The G-E line is complete. Moreover, by specifying G-E materials you will benefit in these five ways:

1. Time is saved because everything needed can be secured at one place.
2. G-E materials were designed to be used together assuring faster installation and a better job.
3. You can be sure of uniform high quality — there'll be no "weak links" in the wiring.
4. No make-shift installations are necessary because the G-E line includes the right materials for every purpose.
5. The wide consumer acceptance of General Electric products will help to assure client satisfaction.

For further information about G-E Wiring Materials either for ordinary installations or for special work write to Section CDW-8612, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

For any job, new or old BLENDTEX *stamps satisfaction on walls and ceilings, economically!*

POCKETBOOKS got a real break when Blendtex was developed For Weatherwood* Blendtex is a new, fascinating pre-decorated wall and ceiling covering—a modern, interior finish that performs four important operations in one easy application.

Blendtex builds. It insulates. It quiets noise. And it decorates! It is as economical for new buildings as for old ones. In only a year this new pre-decorated product, Blendtex, has found its way into hundreds of homes, schools, churches, theaters, restaurants, etc., by the *choice* of architects and owners!

The soft pastel colors of Blendtex harmonize with its interesting texture—blend attractively with furniture and fixtures. Tile and plank units with factory-made joints make a wide variety of smart, modern interiors possible. You stamp satisfaction on your specifications when you specify Blendtex Interior Finish.

Let us send you a new book of beautiful and economical "Blendtexed" interiors in all sorts of rooms, throughout the country. Just use this coupon or see your nearest USG office.

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NEW USES FOR STEEL . . .

reduce HOME COSTS GIVE *greater* VALUES

THE COLONIAL STYLE HOME SHOULD HAVE A TERNE ROOF. Today, U·S·S Terne Roofs are still unsurpassed for storm tightness, resistance to fire and lightning, long life and low upkeep.

PORCELAIN ENAMEL BATHTUB, wash basin, walls and toilet tank. These fixtures have the advantage of great strength, light weight, low cost and permanence.

(below)
NEW WEATHER-PROOF PORCELAIN ENAMEL for shutters, cornice, corner boards and entrance hood. Colors are permanent, fade-proof. Maintenance is eliminated.

DOUBLE LIFE FOR DUCT WORK is assured when it's made of rust-resisting U·S·S Galvanized Copper Steel with its higher resistance to atmospheric corrosion.

TODAY, the most successful building operations are groups of homes or complete communities. Savings are being made through better planning, engineering and quantity buying rather than by the use of lower quality materials.

Steel is well adapted to these large-scale operations. New uses take advantage of better production methods, bringing lower costs and higher values. For example, porcelain enamel is now being used for shutters, cornices, corner boards and entrance canopies. Colors stay permanently bright, never need refinishing.

U·S·S Copper Steel, with double the atmospheric corrosion resistance of plain steel, makes longer-lasting roofing, duct work, downspouts, valleys and gutters. Reduces the yearly cost of these units approximately one-half.

Bathtubs, sinks and wash basins made of porcelain enamel on U·S·S VITRENAMEL Sheets are rapidly increasing in popularity. They weigh less, cost less, and have proved entirely satisfactory.

Stainless steel has had rapid acceptance for kitchen sinks, tables, ranges and work surfaces. It never tarnishes, does not mar.

Steel is finding numerous other uses—new, efficient, steel sheet insulation, cellular steel floor and walls, cupboards, closets, stairways and wall paneling. For information about any of these uses, write to one of the companies listed below.

U·S·S STEEL SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

ALBANY HOTEL
carpeted by BIGELOW

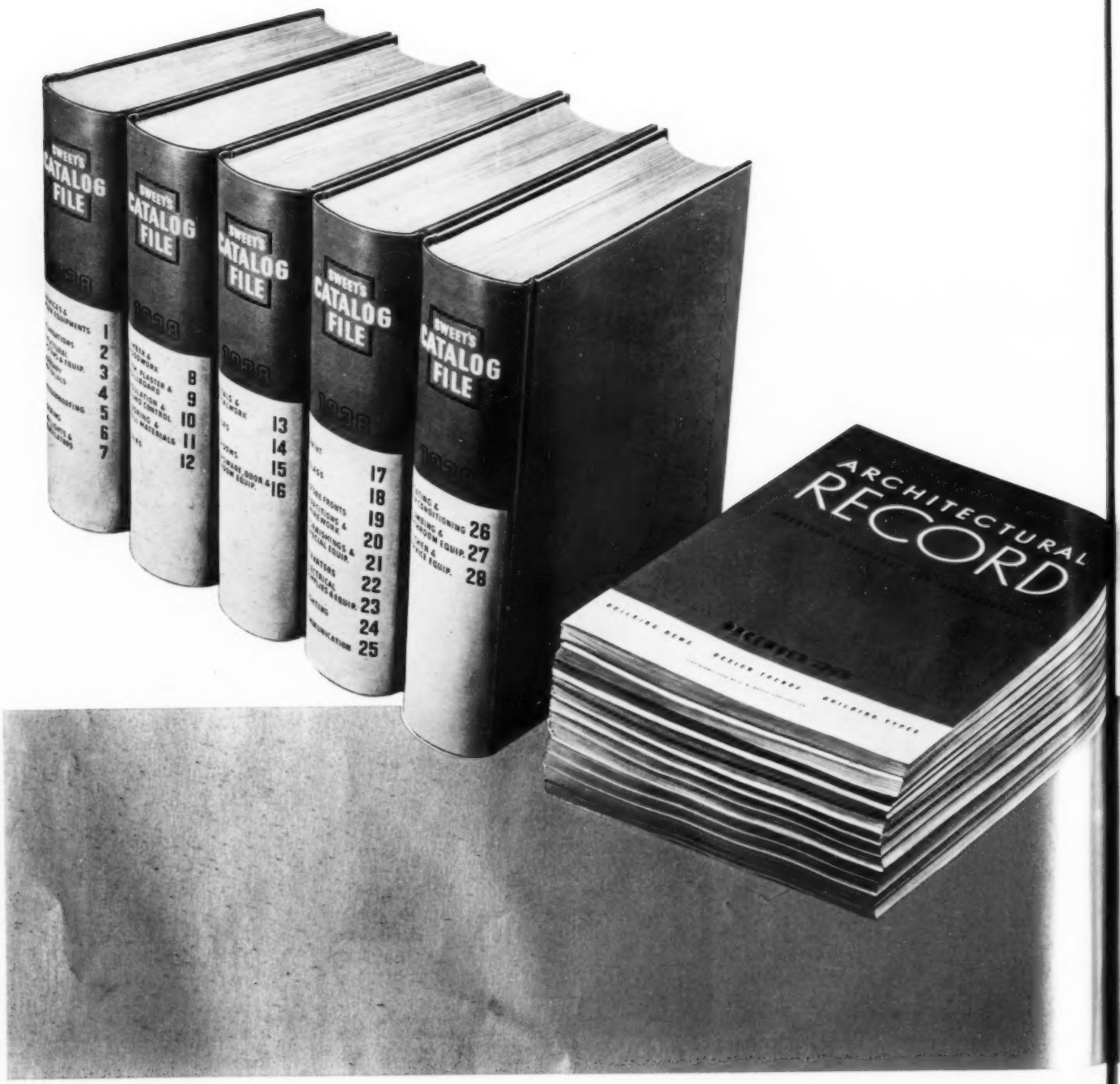
Throughout the beautiful new Albany Hotel in Denver, Colorado, you'll find Bigelow carpets play a major role in the decorative scheme. Special designs and colorings—created by Thornton Fuller, Decorator, and Burnham Hoyt, Architect—were woven to harmonize with the simple modern treatment.

Whatever *your* carpet problem, you'll find Bigelow's Carpet Counsel experts can solve it for you. Contract Dept., Bigelow-Sanford Carpet Co., Inc., 140 Madison Ave., New York.

Albany Wilton carpet — woven specially for the Cocktail Lounge.

Two more fabrics specially woven for the Albany Hotel: Thornton Wilton in the bedroom (above); Special Albany Wilton on the Mezzanine (left).

1939 IS THE LAST



DECEMBER 1938 issue of ARCHITECTURAL RECORD

YEAR OF THE THIRTIES

Another decade will soon have passed. In no time at all, we'll be looking back on the "lean thirties"—we'll be in the forties. No wonder that the theme of New York's World Fair is "The World of Tomorrow." No wonder that men sensitive to time and to change are thinking hard about the future.

When you stop to orient yourself in this world that is *building*, think twice about how vital is *useful* information. Think twice about the scope and kind of information you will need to stay in front. And finally, think twice about how this information should be organized and delivered to you.

On the one hand you have today's users of buildings demanding more and more performance from the buildings you design. On the other you have aggressive, alert manufacturers producing more and more equipment and materials to help you meet these demands. Without recourse to a continuous flow of up-to-date, carefully organized, *useful* information, you will either spend too much time keeping posted on all these developments or be handicapped accordingly.

It is apparent that what is needed most in these swiftly moving days is a dependable *information service*. So far as change is concerned, you can stay in the vanguard with the answers to two questions: (1) What performance requirements are *desirable* for today's buildings; and (2) What is *available* and *usable* for meeting these requirements? Have the answer to those, and you'll more than hold your own.

There *is* an *information service* designed to meet these specifications. It is the coordinated service represented by ARCHITECTURAL RECORD and SWEET'S CATALOG FILE. The RECORD, by means of its single-purpose editorial content, provides building designers with a running record on what performance requirements are *desirable* (and possible of solution) for today's buildings, and, by means of advertising content, keeps them posted on the products and services *available* to meet these requirements. SWEET'S, because of the range of manufacturers represented, further extends this service on what is *available* and then rounds it all out by showing why, where, and how a myriad of equipment, materials and services are *usable*. Together, these two constitute the 1939 model for an *information service* and as such provide architects and engineers (1939 model) with the working tools they need if they are to keep pace with the world that is building.

FORMICA
permanently brightens up KITCHENS and BATHROOMS

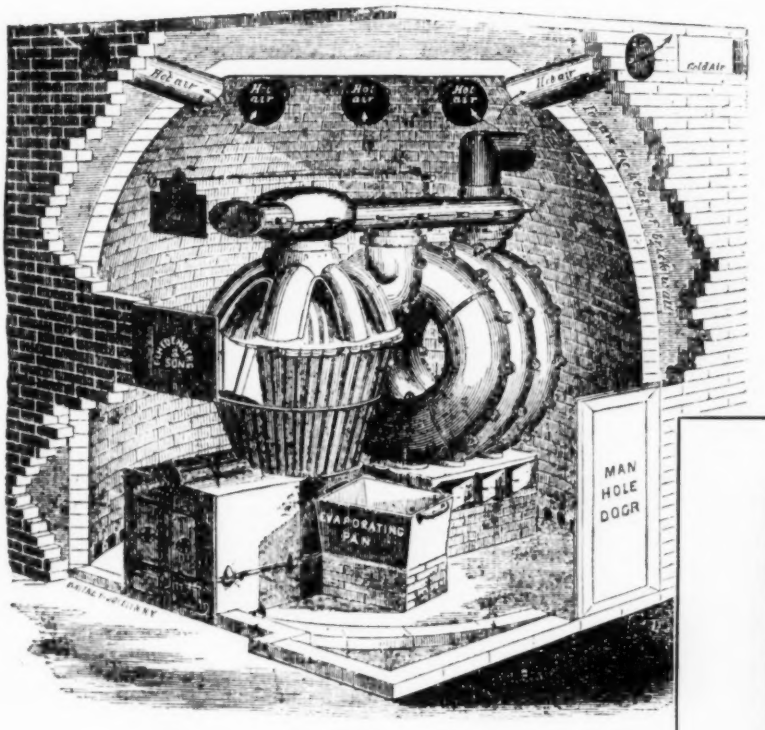
BRIGHT COLORS and smooth surfaces that stay bright and smooth are available for bathrooms and kitchens in Formica. This material will stand up on walls and tops for many years without change in appearance. It is thoroughly modern and easily cleaned. It does not crack or stain.

The greatest variety of effects is possible through combinations of colors and by inlaying one color over another or inlaying metal in color. It is easily cleaned and is not discolored by ordinary cleaning solutions. Ask for Formica literature showing possible designs in color.

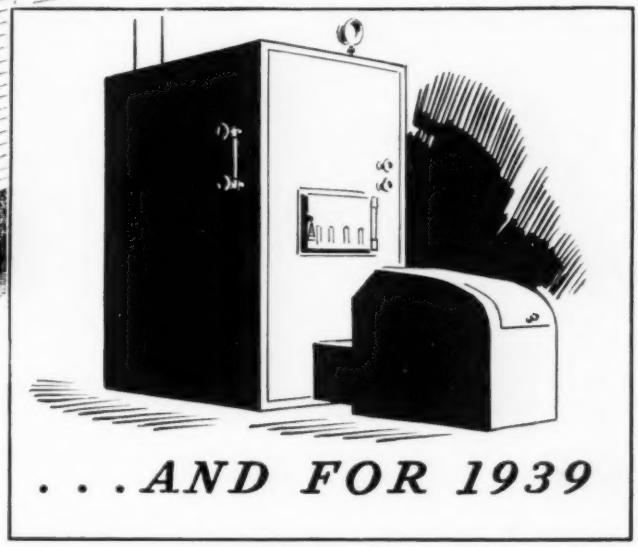
FORMICA

THE FORMICA INSULATION CO., 4620 Spring Grove Ave., Cincinnati, O.

LATEST IMPROVEMENTS



CIRCA 1850



. . . AND FOR 1939

If you had been designing a modern home about 1850, you would have found that the latest, most sensational improvement in heating equipment was a coal-burning furnace like the queer-looking contraption above. It was "tops" for comfortable, convenient, economical heating.

Today, its modern successor with an automatic bituminous coal stoker is the leader in providing comfortable, convenient and *economical* heating. No house or building faces a sure future without proper planning for coal storage and bituminous coal or coke heating.

Designing or modernizing houses and buildings for heating satisfaction in view of the changes in fuel costs and fuel supplies, which seem probable during their lifetime, necessitates planning for coal heating. For ready reference in designing homes for modern heating, we have prepared a new portfolio which gives the fundamental principles and illustrates basement designs for modern bituminous coal or coke heating. Send for a free copy of this portfolio, "The 1939 Basement Plan Book," A. I. A. File 30-G. It will help you plan today for the needs of tomorrow's heating.

NATIONAL COAL ASSOCIATION

Bituminous Coal—the "Universal Fuel"

FOR HOME HEATING • FIREPLACES • HOT WATER
INDUSTRY • INSTITUTIONS • BUILDINGS
POWER • TRANSPORTATION

NATIONAL COAL ASSOCIATION
The Nation-Wide Organization of Bituminous Coal Producers
804 Southern Bldg. WASHINGTON, D. C.
307 N. Michigan Ave. CHICAGO, ILLINOIS

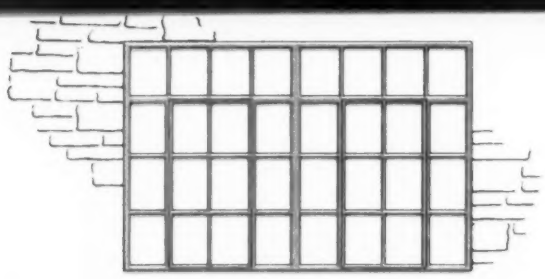
Please send me a copy of your Free Booklet *"The 1939 Basement Plan Book,"* A. I. A. File 30-G.

Name.....

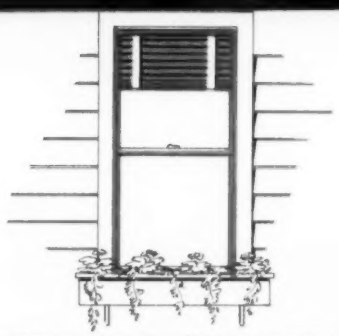
Firm..... *Street*.....

City..... *State*.....

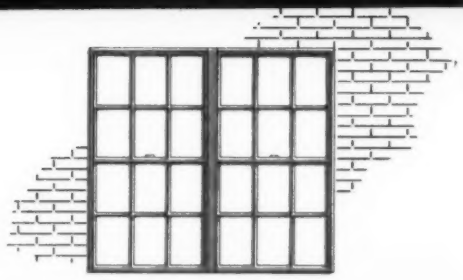
AR-12



Aluminum Casement Windows are easy operating and weather-tight.



Aluminum Venetian Blinds give added beauty and utility.



Aluminum Double Hung Windows for buildings of all classes.

ALUMINUM WINDOWS

DOUBLE HUNG OR CASEMENT

You're hardly aware of the Aluminum windows in a home; they go about their business of letting in light and sealing off the outside air so unobtrusively. That's because frames and sash are very narrow, giving maximum glass area. Their unpainted finish is a pleasing, neutral tone.

Aluminum windows open and close in a remarkably easy manner, always. They are light in weight, and there's no warping or swelling to cause binding. The closely-fitted extruded Aluminum parts from which these windows are fabricated make them permanently weather-tight; no rusting or rotting to require replacements. They never need painting. Cost little to maintain.

The surprisingly low first cost of Aluminum windows is good news to people who are planning to build. Remember that they're complete, ready to install when received by the builder. No knocked-down parts to assemble, no weather-stripping, fitting or refitting.

Aluminum windows are made by the leading window manufacturers. We'll gladly send you a booklet listing these manufacturers, illustrating and describing their various types of windows. Aluminum Company of America, 2167 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA · ALUMINUM

Above: House at Minneapolis. H. H. Livingston, architect. Walls and roof stained with Cabot's Stain in contrasting shades. Blinds: Cabot's Gloss Collopakes. Chimney and trim: Cabot's DOUBLE-WHITE.

—●—

At right: House designed by Taylor and Maas, architects, Stevens Point, Wisconsin. Siding, shutters and roof stained with Cabot's Creosote Stains.

Stains that work with the architect

The wide range of colors in Cabot's Stains will help you get the artistic effect you want. Their preservative qualities will contribute to the permanence of your work, and add to the value received by your client. Write today for new booklet, *Stained Houses.* Samuel Cabot, Inc., 1286 Oliver Bldg., Boston, Mass.

Cabot's Shingle Stains

Creosote » Heavy-Bodied

"I'M NOT THE NERVOUS TYPE"

"I can stand the screech of brakes or the wail of a backfence cat. But brother, when a gritty pencil scratches my drawing I am a prospect for a padded cell. I advise all pencil craftsmen to follow my lead and switch to 'Castell'."

All gritty substance is removed from "Castell" graphite. No hard spots. No flaking, smudging or crumbling. Milled by the protected microlette process, "Castell" graphite has a flowing smoothness and richness of deep black found in no other pencil. "Castell" withstands extra hard pressure without snapping off at the point.

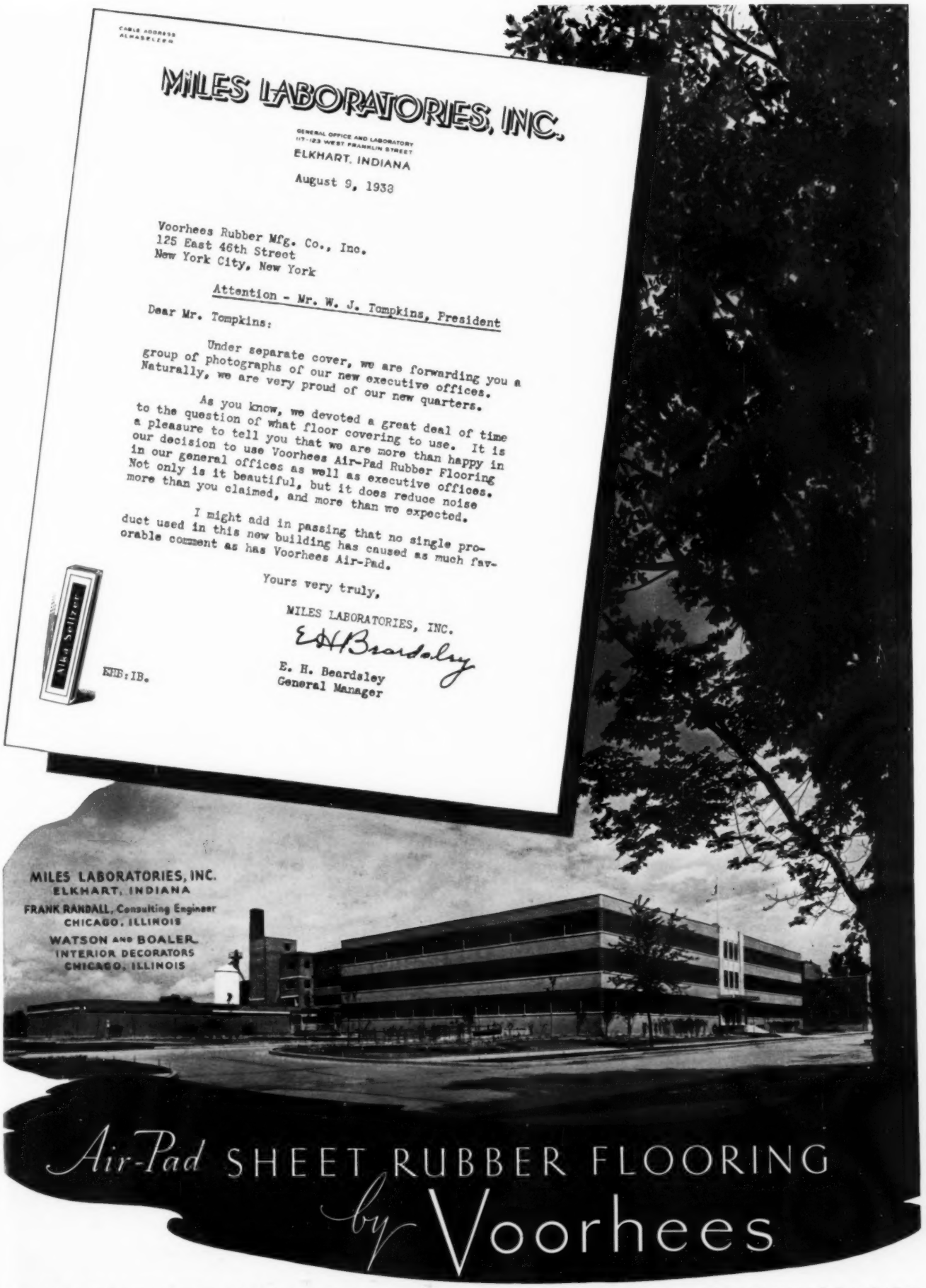
These—and many more—are the reasons why pencil craftsmen are glad to pay twice as much for "Castell" as for ordinary drawing pencils. 18 accurate degrees—7B to 9H. A. W. FABER, INC., NEWARK, NEW JERSEY.

THE HIGHEST PRICED DRAWING PENCIL SOLD IN AMERICA

A.W. FABER-CASTELL

DRAWING PENCIL IN THE METAL BOX

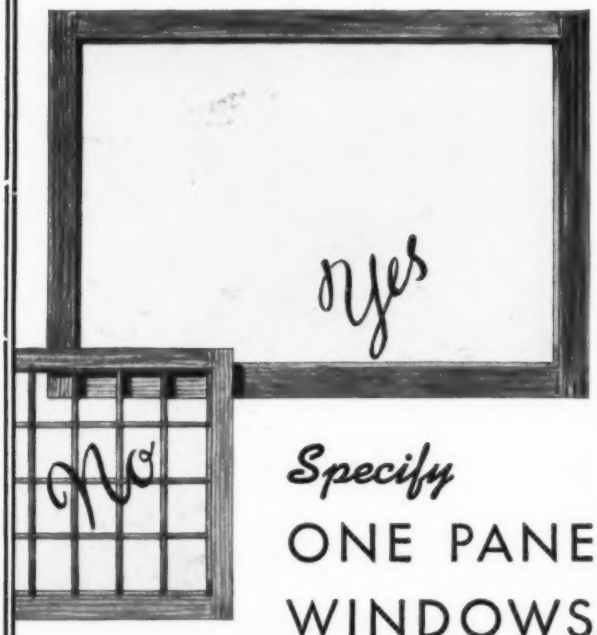
★ 15¢ 1.50 per doz.


MILES LABORATORIES, INC.
GENERAL OFFICE AND LABORATORY
117-123 WEST FRANKLIN STREET
ELKHART, INDIANA
August 9, 1933
Voorhees Rubber Mfg. Co., Inc.
125 East 46th Street
New York City, New York
Attention - Mr. W. J. Tompkins, President
Dear Mr. Tompkins:
Under separate cover, we are forwarding you a group of photographs of our new executive offices. Naturally, we are very proud of our new quarters.
As you know, we devoted a great deal of time to the question of what floor covering to use. It is a pleasure to tell you that we are more than happy in our decision to use Voorhees Air-Pad Rubber Flooring in our general offices as well as executive offices. Not only is it beautiful, but it does reduce noise more than you claimed, and more than we expected.
I might add in passing that no single product used in this new building has caused as much favorable comment as has Voorhees Air-Pad.
Yours very truly,
MILES LABORATORIES, INC.
E. H. Beardsley
General Manager
EHB:IB.
Niles Spitter
MILES LABORATORIES, INC.
ELKHART, INDIANA
FRANK RANDALL, Consulting Engineer
CHICAGO, ILLINOIS
WATSON AND BOALER
INTERIOR DECORATORS
CHICAGO, ILLINOIS
Air-Pad SHEET RUBBER FLOORING
by Voorhees

VOORHEES RUBBER MANUFACTURING CO. INC. 121 EAST 46TH ST. NEW YORK CITY

For

MAXIMUM LIGHT—



Specify

ONE PANE WINDOWS

If windows are to be for practical use rather than decorative, and serve their purpose of light transmission, then why not specify one pane, or the undivided windows?

In a test conducted by The Pittsburgh Testing Laboratories, it was found that the undivided window transmits from 8% to 30% more light than the divided window. And also there is less eye strain with an undivided window.

Consider the advantages of the one pane window and specify Clearlite Quality Glass.

Clearlite WINDOW GLASS

EASY ON THE EYES

Fine Glass For Fine Buildings

FOURCO GLASS CO.

General Offices: CLARKSBURG, W. VA.

Branch Sales Offices

NEW YORK • CHICAGO • DETROIT • FT. SMITH, ARK.

PRECISION-BUILT *Homes*

30 days from your board to the finished house

ALMOST $3,000,000 worth of architect-designed, Precision-Built Homes have already been erected!

Here is the most revolutionary method of home construction yet devised; more house for the money; standard materials and quality construction used throughout; built in 30 days or less; doubly insulated; one-piece, *permanently* crack-proof walls; eligible for FHA loans.

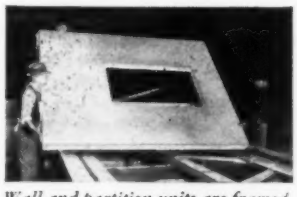
With this method, any frame building—of any size or design—can be completely built and ready for occupancy in a minimum of time. The exterior finish may be our own Sand Finish (resembling stucco and more enduring) or brick veneer, stone veneer, patented sidings, clapboards or shingles.

With the Simplified Method of Planning, your own time for drafting and supervision is likewise reduced to a minimum. With our merchandising plans, you have business brought to you—by your local lumber dealer, contractors and realtors. You can handle even low-cost homes at a *profit.*

Let us send you our Simplified Method of Planning—show you how it saves many hours in both drafting and detailing. The entire system is incorporated on 20 compact, convenient cards—which are a joy to use. The system includes the most revolutionary method ever devised for calculating rafters of every type. You have complete flexibility—no limitations on your design. You do not have to modify a single dimension.

We invite you to write for the full details. The Simplified Method of Planning is sent at your request—without charge. New business is now available to you. Get your share.

Precision-Built construction starts in the shop—where all lumber is pre-cut.



Wall and partition units are framed from working drawings, with doors and windows integral.

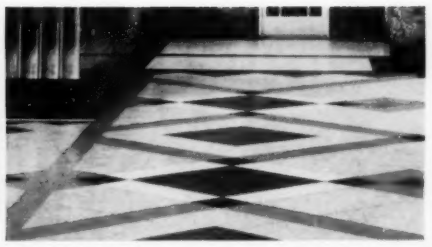
Complete sections are delivered by truck to the location.

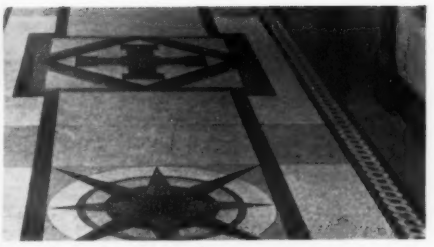
In 2 hours all partitions are up; the job is ready for roofing with pre-cut rafters.

Raymond Rigby · Burlingame, Cal. Architect.

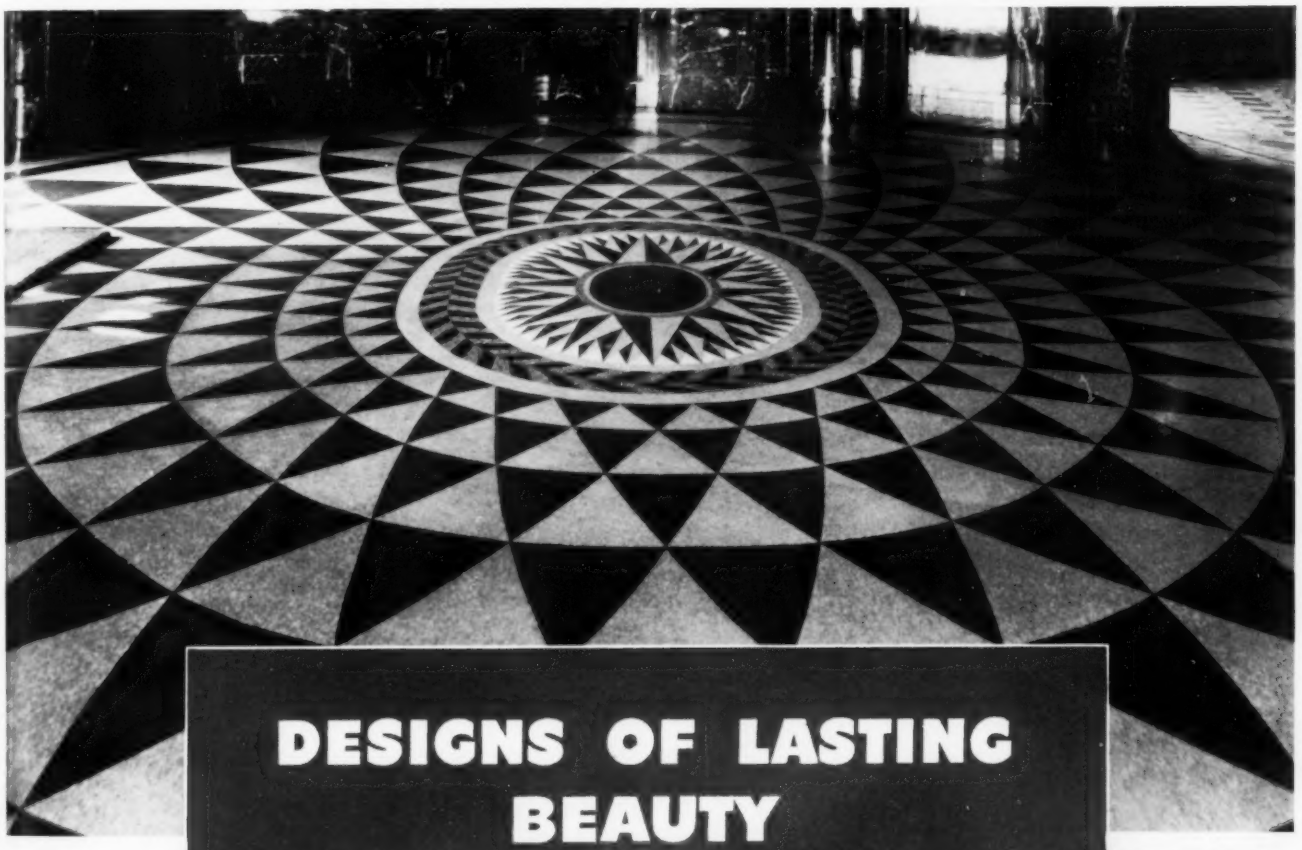
HOMASOTE COMPANY

TRENTON · · · NEW JERSEY





● Swirling bands of color, squares, triangles—any design or pattern you specify can be followed easily with Terrazzo. The infinite pattern possibilities, plus a color range from white through vivid colors to deepest black, are responsible for the increasing use of Terrazzo in many types of buildings.



DESIGNS OF LASTING BEAUTY

for the busy homes of business

FEET—hurrying in and out of office buildings, rushing on the errands of business! You need a floor of lasting beauty and character to stand up under the steady, day in and day out pounding.

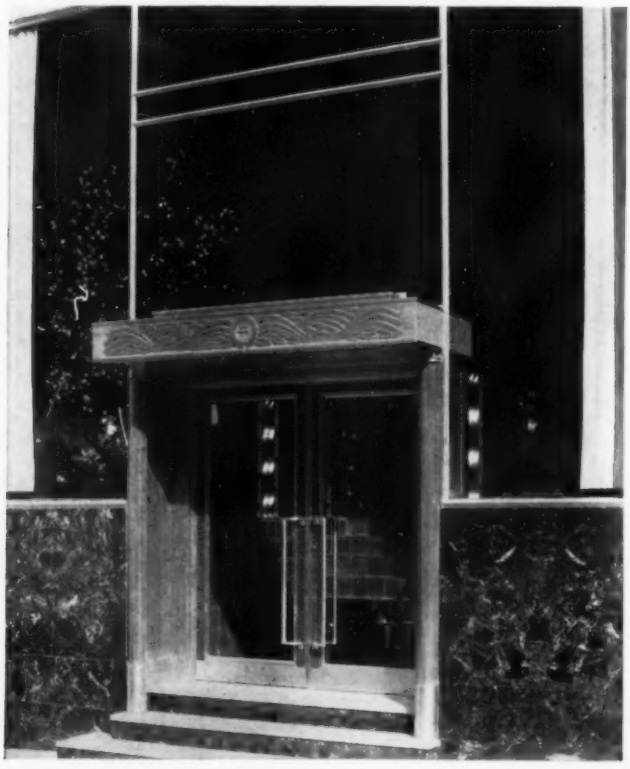
Terrazzo floors grow in favor more and more for modern office and commercial buildings because they refuse to wear out. They offer you the widest latitude in design and use of color—and they stay fresh and colorful for life

Terrazzo is dense, hard concrete. It is difficult to stain or soil. It needs a minimum of care and it is reasonable in cost. Your clients will appreciate these advantages. And you will be pleased at the ever new and original designs at your command. Terrazzo floors are literally made to your special order.

Let us send you detailed information about this unusual decorative and structural material for lobbies, hallways, stairways and wainscoting. Write the National Terrazzo and Mosaic Association, 1406 G St., NW, Washington, D.C.

THE NATIONAL TERRAZZO AND MOSAIC ASSOCIATION

How to Control Entrance Doors Without Defacing Them

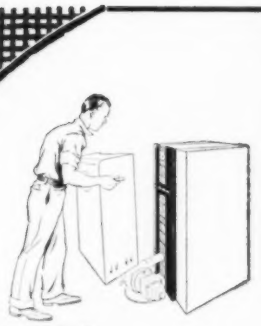


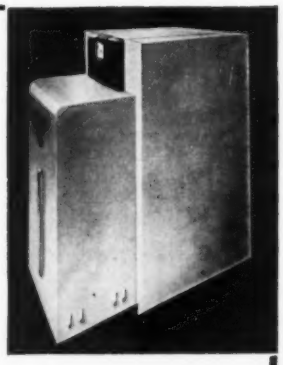
It's No Problem at All with LCN Overhead Concealed Door Closers

★

In this entrance to the Francis Motor Car Co. showrooms in Portland, Oregon, architect Richard Sundeleaf has succeeded in keeping his interesting modern design free from the marring effect of exposed machinery. Yet he has provided smooth, positive, reliable door control at moderate cost by using LCN series 200 Overhead Concealed Door Closers. Thoroughly tried and proved by years of service in modern buildings from coast to coast. For details see Sweet's or address Norton Lasier Company, 466 West Superior Street, Chicago, Illinois.

★





On and Off Advantage of the

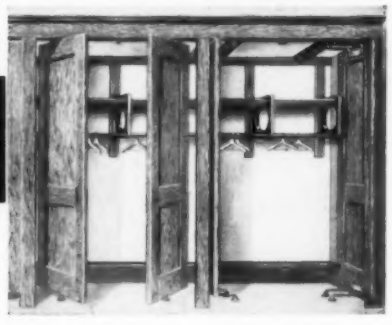
Yello-Jacket BURNHAM That Stings The Fuel Bill

If you burn oil, you can have the burner either jacket enclosed or not. If you start by burning coal, and want to switch to oil, it's a simple matter. Or if you want to switch from oil to coal, it's just as simple. Should you decide to burn neither one, but use gas, you are still in an enviable position. No matter what the fuel this new Burnham Yellow-Jacket Boiler stings the fuel bill. This new boiler not shown in our catalog in 1938 Sweet's, but will be in 1939 edition. Send for special Yellow-Jacket folder.

BURNHAM BOILER CORPORATION
Irvington, N. Y. Zanesville, Ohio

Burnham Boiler

VANISHING DOOR



Wardrobes

SIMPLE • PRACTICAL • LOW COST

Count These Advantages

Saves Space
Easy to Install
Easy to Operate
Unbelievably Quiet
Silent Operation
All Sizes
Low Cost

Use this wardrobe wherever a simple, practical and economical unit is required. Here are its advantages:

SAVES SPACE—Doors swing back into wardrobe entirely out of the way.

EASY TO INSTALL—Hardware is simplicity itself. All woodwork is cut accurately to size and delivered in the knockdown.

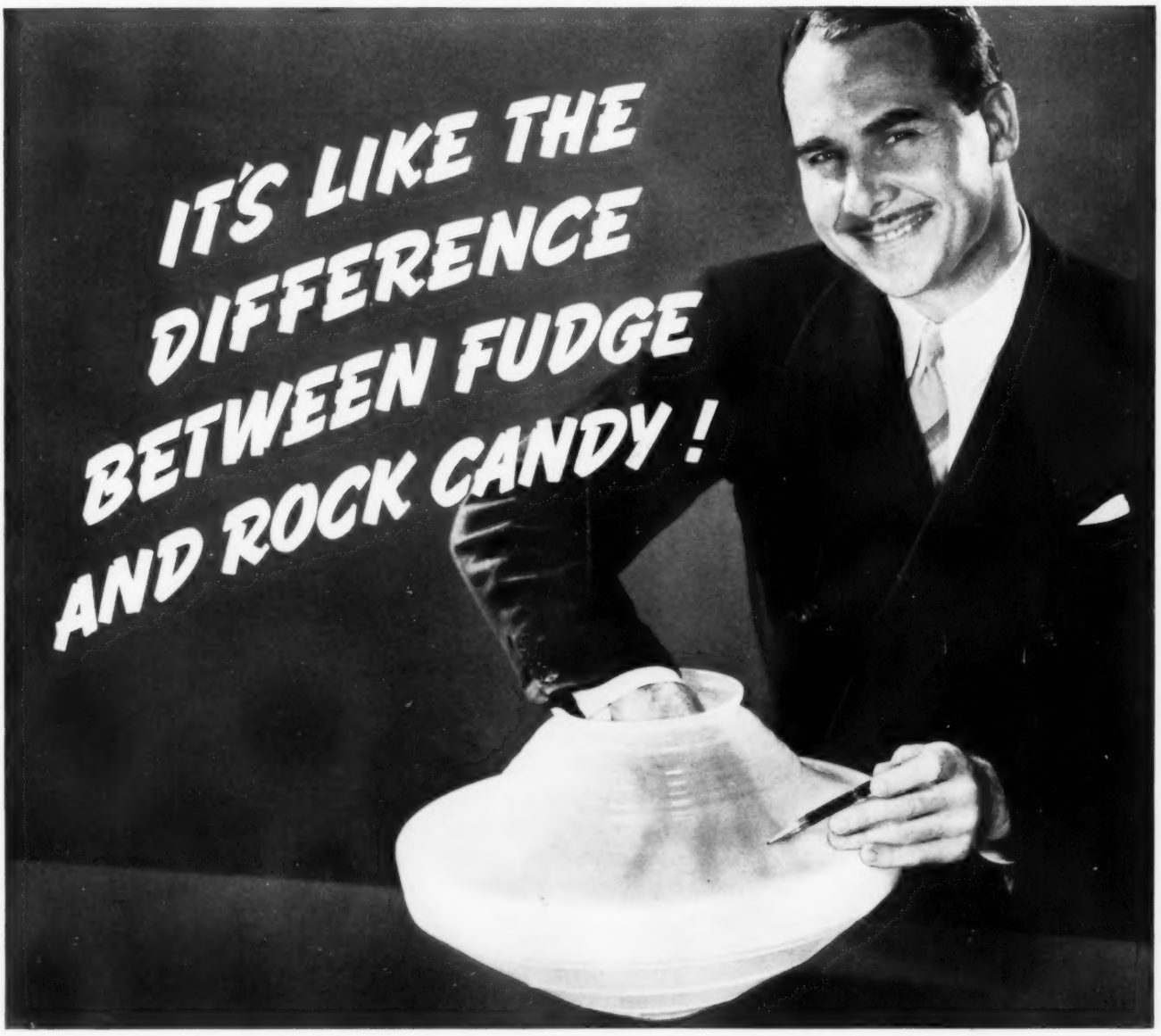
EASY TO OPERATE—All doors swing quickly and easily as on common butt hinges.

UNBELIEVABLY QUIET—There are no tracks, guides, or other complicated mechanisms to rattle, squeak or get out of order.

ALL SIZES—A full range of sizes and types are available. Write for catalog.

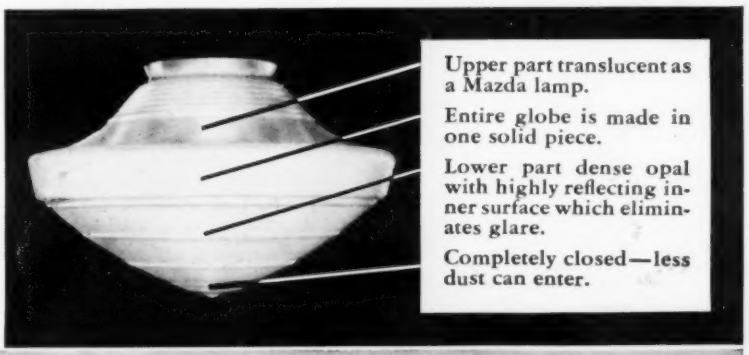
LOW COST—The great number sold, and the standardization allowed enables us to pass on the savings obtained. It is surprisingly low in cost.

W. L. EVANS CO., Washington, Indiana



THIS simple comparison explains how Corning lighting engineers solved a baffling problem . . . the problem of combining low brightness and high efficiency in one all-glass enclosing globe.

Like candy, certain glasses can be made either clear or opaque, depending on the method of heat treatment. But where Corning's new Macbeth Galax brand globes differ from ordinary globes is that they combine *both* types of glass in *one* solid piece! The result is a higher efficiency than any other type of semi-indirect unit . . . a surface brightness well within A. I. A. and I. E. S. specifications for school lighting . . . and far less depreciation due to dust than with totally indirect units. Galax globes are sold at representative jobbers everywhere. If you'd like to see for yourself how Galax globes meet your requirements for lighting schools, hospitals, or public buildings, let us send you a free sample cut from an actual Galax globe. Write to Illuminating and Optical Division, Dept. R-12, Corning Glass Works, Corning, New York.


Upper part translucent as a Mazda lamp.
Entire globe is made in one solid piece.
Lower part dense opal with highly reflecting inner surface which eliminates glare.
Completely closed—less dust can enter.

CORNING *means* Research in Glass

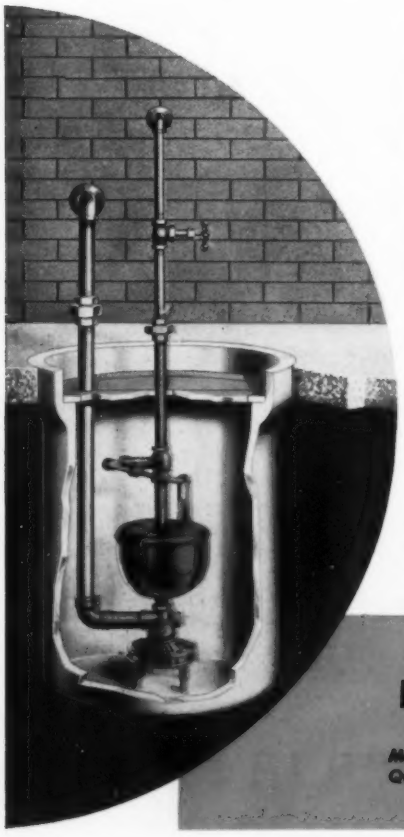
LIKE FIRE FIGHTING EQUIPMENT

Penberthy Pumps Stand Idleness But Function Instantly When Needed

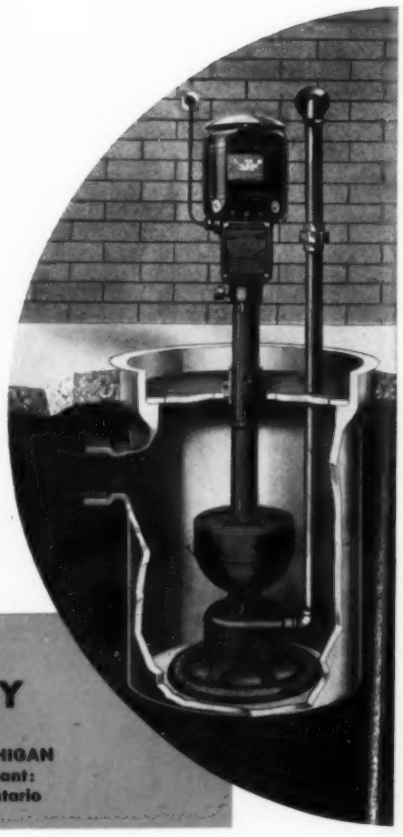
Fire fighting equipment, idle most of the time, must go into action instantly and must function perfectly for indefinite periods with no excuses accepted for failure. Sump pumps and Cellar Drainers meet much the same conditions. Idleness is often a more severe test than prolonged operation.

Penberthy Automatic Electric Sump Pumps and Water Operated Cellar Drainers stand idleness or peak operation equally well. Made of copper and bronze throughout, they are proof against corrosion. Simple, rugged design and careful workmanship assures complete reliability in operation.

Carried in stock by leading jobbers everywhere —Penberthy Sump Pumps and Cellar Drainers will give your clients complete satisfaction.



***PENBERTHY AUTOMATIC CELLAR DRAINER** (Water or Steam operated) Made in 6 sizes*



***PENBERTHY AUTOMATIC ELECTRIC SUMP PUMP** Made in 6 sizes*

PENBERTHY INJECTOR COMPANY

Manufacturers of Quality Products Since 1886

PENBERTHY PRODUCTS

DETROIT, MICHIGAN
Canadian Plant: Windsor, Ontario

BARBER-COLMAN

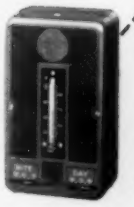
ECONOTROL

SYSTEM OF ZONE REGULATION

CONTROL CABINET. Motor-driven unit provides heat-on periods at regular intervals. Rheostat permits manual modification of heat-on period. Switch gives open-close control. Signal lights, relays, other accessories, included. Signals and controls can also be remotely located.

THERMOSTATIC ADJUSTER. Mounted outdoors. Automatically sets length of heat-on period in accordance with *outdoor* temperature. More heat for cold weather, less heat for warm weather.

TIME SWITCH (OPTIONAL). Automatically controls shut down to lower night temperature and starts warm up period in the morning.



INSIDE THERMOSTAT (OPTIONAL). For all-over shut down to lower night temperature. Puts system full-on during warm up period.

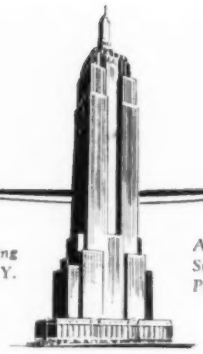
MOTOR-OPERATED VALVE. On steam main for entire building or zone. Equipped with auxiliary switches which may be used to control other valves, an oil burner, stoker, gas valve, or hot water circulating pump.

GOVERNS EFFICIENCY *and* ECONOMY *of* HEATING

Electric OUTSIDE-INSIDE TEMPERATURE CONTROL

Owners of existing office buildings, and similar structures having single or multi-zone heating systems, can be assured of economical heating and maximum efficiency of heat control by installing a Barber-Colman Automatic *Electric* ECONOTROL System of Zone Regulation. The equipment is readily installed in any type of building and requires but few electrical connections. It has a wide range of adjustment with manual as well as automatic controls. Economy is assured, as exemplified by one owner's report which shows 84% annual return on the investment with heating costs reduced over 16%! The ECONOTROL System provides heat to meet weather conditions, prevents overheating or underheating, and thus keeps heating cost at an economical minimum. Write for further information, or see your nearest Barber-Colman representative.

BARBER-COLMAN COMPANY • ROCKFORD, ILL.



Jenkins Valves are controlling all pipe lines for both plumbing and heating in the Empire State Building, New York, N. Y.

Architects: Shreve, Lamb & Harmon • Engineers: Meyer, Strong & Jones • Heating Contractors: Baker, Smith & Co. Plumbing Contractors: J. L. Murphy, Inc • All of New York

WHEN YOU SPECIFY

Jenkins

FOR AN OFFICE BUILDING

VALVES are a vital part of your plans . . . the only control over the supply of steam and water which are so essential to the operation of an office building.

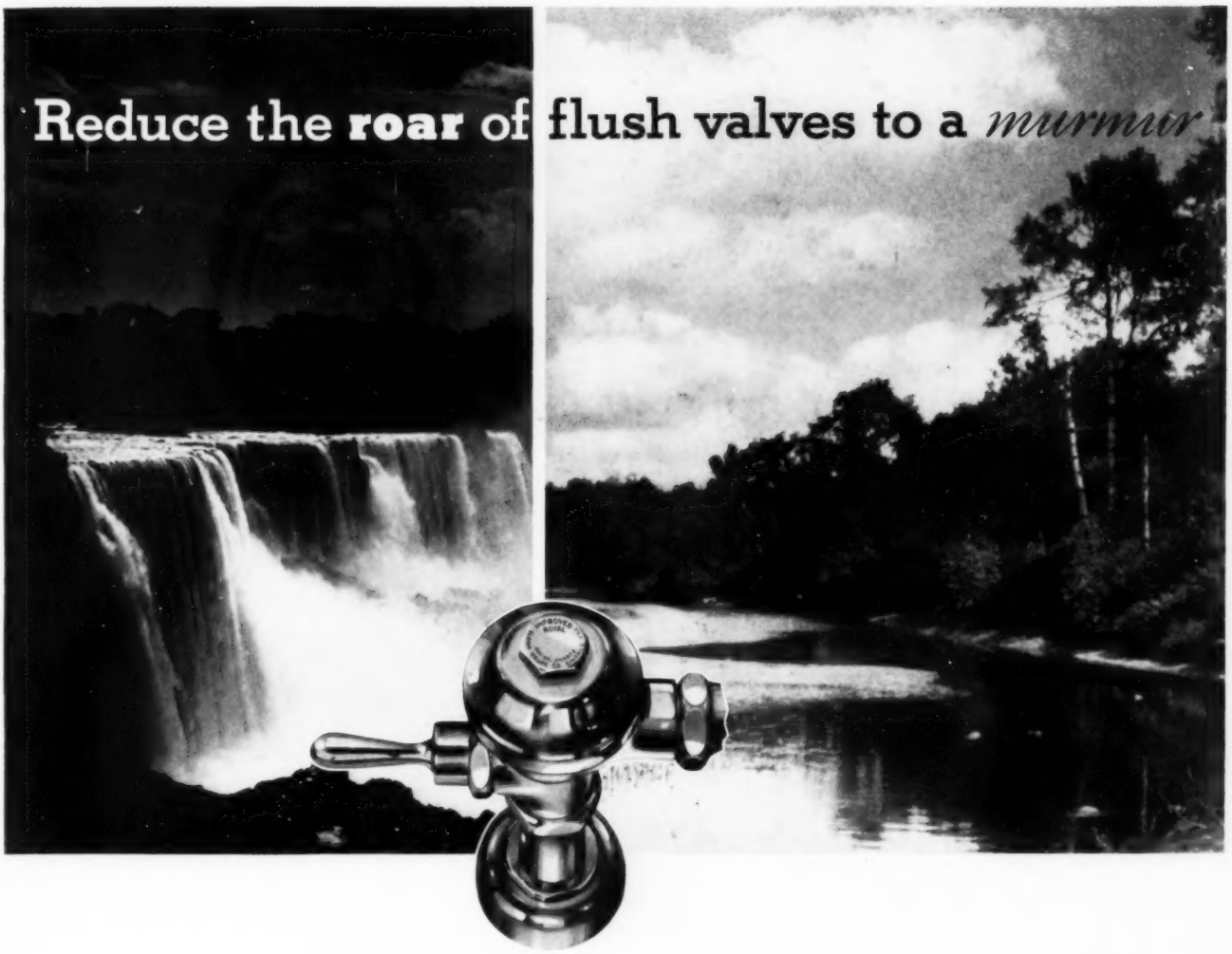
By being sure you have adequate valves for safe control . . . and the right valve for each specific service, you are protecting your client against failure, costly interruptions, even serious injury and property damage.

You can write "Jenkins" into a specification for controlling all pipe lines, knowing that your clients' investment in valve equipment is insured for the lifetime of the building.

JENKINS BROS., 80 White St., New York, N.Y.; Bridgeport, Conn.; Boston; Chicago; Philadelphia; Atlanta; Houston. JENKINS BROS., Limited, Montreal; London, Eng.

Prompt delivery of Jenkins Valves from good supply houses everywhere.

IN VALVES *Jenkins* GIVES YOU EVERYTHING



Any installation of Sloan Royal, Crown, Star or Naval Flush Valves, regardless of when installed, may now be made *completely quiet* by installing two small silencing elements. Merely replace the present stop valve; then insert a new guide and seat in the flush valve. This single inexpensive change reduces flush valve noises to the faintest whisper. • Sloan-equipped hotels—hospitals—apartments—offices—schools (every place where noise elimination is desired) are now adapting this easy, economical solution to the noise problem. • Sloan *Quiet-Flush* equipment is unlike any other silencing device. It combines the best features of generally known methods with important contributions from Sloan research. The world's most universally used flush valve now offers you the added advantage of quiet operation. Write today for descriptive folder.

See our comprehensive Catalog in Sweets

SLOAN VALVE COMPANY • CHICAGO
4300 WEST LAKE STREET

SLOAN *Quiet Flush* VALVES

BUSINESS DEMANDS QUIET IN MODERN OFFICES

HERE'S HOW ONE ARCHITECT MET THAT DEMAND

Calicel, Acousti-Celotex, and Acoustical Tile Ceiling were combined to achieve QUIET with adhering to the architect's ideas of decorative treatment in this new First National Bank of Greenville, S. C.

Detail of Calicel wall treatment reveals simple richness, with no hint that here lies the answer to absence of clamorous echoes.
J. E. Sirrine and Company, Architects

PAINTABLE — PERMANENT

ACOUSTI-CELOTEX

TRADE MARK REGISTERED — U. S. PATENT OFFICE

CALICEL

REG. U. S. PAT. OFF.

Combined to Achieve QUIET Beautifully

WHEN designing the impressive interior of the new First National Bank at Greenville, South Carolina, the architect was striving for a definite aesthetic effect. He was at the same time faced with the need for effective acoustical treatment.

By combining Acousti-Celotex in the ceiling and Calicel in the side walls, the desired effect was obtained—both aesthetically and acoustically.

Celotex Acoustical Service is at your disposal the next time you are faced with an acoustical problem. Consultation entails no obligation on your part, and *may prove of real assistance* in achieving your desired architectural effect—while meeting the demands of business for QUIET.

Copyright 1938, The Celotex Corporation

ACOUSTICAL PRODUCTS BY

CELOTEX

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ACOUSTI-CELOTEX — CALICEL — CALISTONE

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